AN EXPLORATION OF THE INFLUENCES ON CLINICAL DECISIONS MADE BY CHARTERED PHYSIOTHERAPISTS IN RELATION TO THE HEMIPLEGIC UPPER LIMB FOLLOWING STROKE

G M BAMBOROUGH

DPT

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Abstract

Introduction

This study explored the clinical reasoning and influences on decisions of physiotherapists' identification and treatment of upper limb movement difficulty following stroke.

Methods

This was a pragmatic, practice based, mixed methods approach, undertaken in three sequential phases. Physiotherapists practicing in neurological rehabilitation (n=143) responded to a survey to identify broad areas of influence on examination and treatment of stroke. Semi-structured telephone interviews were conducted with a sub-group of respondents (n=10) in order to further explore influences on the content and structure of examination and selection of interventions for the upper limb.

A separate group of neuro-physiotherapists (n=5) and service users (n=5) was recruited from the stroke service of an NHS Foundation Trust Hospital. A single physiotherapy treatment session was recorded and a semi-structured interview conducted with each participant whilst viewing the tape of the session in which they had been involved. Physiotherapists were asked to describe their reasoning during delivery of the intervention; service users to describe their experience of the treatment.

Data analysis

Phase 1 data were analysed using SPSS® version 21 (Chicago, Illinois). Thematic analysis was conducted from interviews in phases 2 and 3 with regard to examination, planning and delivery of a physiotherapy treatment session.

Findings

Survey results found that clinical decisions were primarily influenced by clinical experience and theoretical knowledge. Other influences were time after stroke, structural features of the service including skill mix and working with other health care professionals.

Thematic data analysis of telephone interviews supported influence of clinical experience, theoretical knowledge and service structure. A structured but flexible approach was discussed in relation to examination and interpretation of findings. Wider holistic influences included the sensory and emotional aspect of stroke and therapists' perspective of their role and professional responsibilities.

Interviews conducted when viewing the recorded treatment session indicated agreed perception of treatment as a physiotherapist led but interactive process. Collaboration and service user's contribution to decision making varied and confidence in their contribution was

influenced by sensory awareness. Therapist's decisions regarding session structure and content were influenced by theoretical knowledge, experience and technical skill.

Service users described personal objectives tempered by uncertainty regarding what therapy should comprise and achieve. Sensory aspects of movement were valued regardless of direct translation into function and desire reported for more discussion to support both functional gain and independent exploration of movement.

Conclusion

Although findings are limited by the small number of participants this study generates insight into influences on decisions made during the selection and delivery of physiotherapy post-stroke. Findings identify features contributing to a flexible examination structure which accommodates differing client presentation, the collaborative nature of examination and treatment and the value accorded by service users to sensory aspects of movement.

Suggestions

Further research into physiotherapy treatment decisions about aspects of movement change after stroke, within different time frames, stroke services and geographical areas is required. Service user perspective should be explored in greater depth and detail.

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In addition to the academic and professional support I would like to extend my thanks to my family for their belief in me and my friends for support and encouragement whenever I needed it.

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by Northumbria University Research and Ethics Committee (28.11.11), the Integrated Research Application System (City Road and Hampstead; Project number: 12/LO/0819 received 19.09.12) and the Foundation Trust Research and Development Department (03.04.13).

I declare that the Word Count of this Thesis is 86,619 words

Name:

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Date:

Preface

The impact of stroke: “Steve and Katherine’s story”

20 years ago Steve had a stroke; when he woke in the morning he showered and dressed, made breakfast, kissed his wife, drove his children to school and worked all day. He made phone calls, wrote reports, attended meetings, laughed and joked with colleagues and then sat down in the evening to watch the news before his evening meal. An hour later he was in hospital and his wife Katherine was shocked and tearful as she watched the strong, clever, funny and articulate man she was married to attempt unsuccessfully to talk and to move his right arm and leg. Doctors used unfamiliar medical words to describe the event which would change the entire family’s life: he was 58 years old.

I met Steve and Katherine six months later after he was discharged home from hospital. He was able to stand and take a few steps, his right arm and hand were tight and painful, his speech was limited and he easily became frustrated. Steve was tense and furious at what had happened; Katherine was silent and exhausted. Despite his difficulty with speech he made it clear that he intended to walk and use his arm again. He would work very hard to achieve this but the rest was up to me. Although the doctors and physiotherapists in the hospital had not been able to put him “back together” he was willing to allow me to remedy their failure and he wanted me to return him to some semblance of the life he had before: I was absolutely terrified!

His determination was relentless and his “short fuse” very apparent. We spent the next 12 months trying to find some way of working together. During this time his expectations took me to the very edge of my skill as a therapist and on many occasions he was so angry with me that he would have “walked out” if only he could!!! However, gradually he and Katherine began to trust me and to tell me more about their lives before the stroke and I saw that although he’d always been hot tempered much of his present anger was based in fear and powerlessness. Steve felt that he wasn’t the same person he had always been; he believed that this was a “less able” and a “less

lovable" version who could no longer support his family financially or share and contribute to their family life. Everything had changed; his body and the way that he experienced and related to the world had altered. He could not go back to his job: their personal and family lives were affected to an enormous extent by his altered movement, sensation and communication. Steve who was very strong and independent now had to confront feelings of dependence and guilt over what he would need from other family members. He was frustrated at not being able to feel his body "properly", use his body effectively or see everything in his field of view.

Katherine was tired and tearful; she couldn't always understand what Steve was trying to tell her and she too was trying to make sense of this new "post –stroke" world. She loved him but was overwhelmed by his raw emotions and felt that she was expected to "cope" regardless of how she really felt. She hid much of what she was feeling from Steve because she didn't want to upset him and she had no idea what the future would hold; like him she was scared. I was very aware of how fragile they were emotionally and I felt responsible for Steve's movement and their happiness; I had no idea how I was going to approach discussion about discharging Steve from physiotherapy.

Steve did walk again although not as well or as far as he had hoped; he didn't regain the ability to write but he did get some movement in his arm and was able to put his arm around his wife and "dance" at a family party later that year. I treated him for longer than was needed for his recovery but long enough to demonstrate to him that he had reached the highest level of movement and activity that was possible. I still think about Steve and Katherine and wonder how they are managing.

Steve was one of my most memorable patients because he was so very angry and determined. Long before "person centred care" was on the agenda of any Government he demanded to be consulted about his treatment wishes and options and he expected a full explanation in words that he could understand of every aspect of treatment and a rationale for why

it should be done that way. If my suggestions didn't meet with his approval, then he would do things his way and that was the end of the discussion!

He and Katherine taught me a great deal about the reality of living with stroke and the true meaning of person (family) centred care. I realised that doing the best that I could simply wasn't enough. I needed to be able to explain, discuss and justify my clinical decisions about treatments. These decisions would affect their lives, and if I couldn't do that then I should get out of the way and introduce them to someone who could.

Reflection: "my story"

During the past 20 years I have worked with clients after stroke at all points during their recovery: acute and rehabilitation, in-patients and out patients, in hospital and in their own homes. This experience of seeing people over time frames varying from only a few hours after stroke to many years has made me very aware that once someone has experienced a stroke it NEVER goes away. Patient (and their family) spend the rest of their lives with the consequences of the event. What therapists do in the early stages has a very long term effect (on someone else's life!) and being sure that what we offer is the best possible intervention is very important.

I was frequently aware of the determination of my clients; they didn't easily give up, they worked constantly to improve their movement and they looked to me as a therapist to help them. The weight of expectation increased as I became more experienced. From the patient, their family, junior physiotherapy staff, students, other members of the MDT and from my-self. This was a mixture of professional and personal pride, I wanted others to value the skills and knowledge of physiotherapists' but I also wanted to know that my personal practice was as good as possible. There were therapists working in the region whose treatment was acknowledged to be innovative, extraordinary and based on what was then newly emerging theory about neuro-plasticity. I applied for jobs which allowed me to work with these therapists and I tried to learn from them and model my practice on theirs.

This was a steep learning curve. My physiotherapy “training” had prepared me better for decisions related to musculoskeletal and cardiorespiratory therapy. The concept of assessing and changing movement of the body by “treating the brain” was new and I absolutely loved it. This wasn’t teaching people how to “adapt” to their stroke; this was developing treatment so that they could recover movement. I was overawed by it; I enrolled on numerous courses (theoretical and practical; primarily based on the Bobath concept) and I met some wonderful practitioners who were able, for the first time in this field of physiotherapy, to explain to me why what they were doing should work. However, there was a gap which I could never quite bridge. The theories of neuro science and movement control were fascinating, but the practicality of pulling together all of the threads was a constant challenge. This required understanding assessment and observation to support decisions about what to do, what posture to work in, when and where to place my hands, how much assistance or resistance to give and considering other medical and physical restrictions so that in making one aspect better I didn’t risk making another aspect worse. Also to consider the sensory and communication consequences of stroke and the shattering of identity that the patient and their family may have experienced. Stroke is not simply a movement problem: it’s a life changing event. There were many occasions when I didn’t feel that my level of knowledge and skill were adequate.

Stroke medicine has progressed since then. I now work on a specialist stroke rehabilitation unit offering acute intervention and MDT treatment. Although acknowledgement of the impact of stroke and the importance of specialist care has increased the profile of this area of rehabilitation limitations still exist.

There is no defined framework for physiotherapy post graduate training in neurology which would facilitate access to information and record progress of skill. Clinical courses are not professionally reviewed or formally accredited and these embrace a range of skills; some of which have greater specific research support than others. Additionally, the material is generally only

available to course attendees' and it can be difficult to keep "up to date" with current delivery.

Current knowledge and eligibility for Physiotherapy registration is monitored by the Profession. There is pressure that practice should be "evidence based" and increasing demands that physiotherapy practice should meet standards and consider interventions designated by external bodies. I acknowledge that development of the evidence base for physiotherapy in this area is vital; as an academic I embrace the need to provide new graduates with the highest level of information with which to support their clinical decisions. However, as a clinician I read about interventions which may have been shown to be effective but are often poorly defined and undertaken under conditions which I cannot match and I don't have access to some interventions (Functional Electrical Stimulation machines, 'Saeboflex'™ splints).

Thus I am forced to use my knowledge to review the options which are available to me and which I have the skills and support to apply. The outcome may be based on evidence but it is pragmatic. What is the best option that I can offer taking into account the wide range of factors which I need to consider? If this is a common experience one stream of practice development should be to review and understand decisions made within current provision. Future development can then retain the opinion of the clinician and evidence can be derived in such a way that it is clinically applicable as well as academically sound.

From a personal aspect I feel that I make decisions based on my analysis of the clinical presentation. These inform my initial "package" of treatment and are re-evaluated, adapted and progressed throughout delivery. Areas considered are:

- What are the problems (motor, sensory, perceptual)

- What is the relationship between them (are they causal/consequential; primary /secondary)
- How do these interfere with motor control
- What could I do about them (what are the options)
- What can I do about them (resources; knowledge and ability to deliver)
- What are the priorities of the patient /family
- Which treatment options will address these factors (content and order of delivery)
- Delivery (client and therapists' position, who will be involved and in what way)
- Evaluate (key aspects during and after treatment)
- Adapt in relation to evaluation

This cyclical process of clinical problem solving is based on a mixture of hypothetico-deductive reasoning and pattern recognition and it is consistent with standard models of clinical decision making (Higgs & Titchen, 1998; Higgs *et al*., 2008; Croskerry, 2009) but because these are conceptual they lack supporting detail about specific features and I wanted to determine if the aspects of client presentation which I use to support my decisions match those which are used by other physiotherapists.

So what I needed to know was:

- How do physiotherapists interpret the information which they collect during assessment and treatment
- Are there aspects of presentation which relate to selection of identified interventions
- How is the analysis approached
- Are there agreed treatment options
- Are there indicators which inform treatment selection (or rejection), treatment delivery, treatment adaptation, progression (or rejection)

To this end I am undertaking this study in order to explore, record and learn from the knowledge and skills of other physiotherapists and in order to make a contribution to extending knowledge and improving treatment skills for other practitioners.

Introduction

The upper limb is central to function and identity (Dettmers *et al*., 2005; Shumway Cook & Woollacott, 2007). It allows independence, exploration of our environment, communication, caring for others and demonstrating affection. Additionally, we express individuality through emotionally satisfying activities such as art and music and activities of daily living such as cooking.

Each arm can act independently in order to position the hand and work in association with the opposite limb to combine strength and increase the scope of function. This allows coordinated action for balancing, reaching, grasping and manipulating objects in our personal space and wider environment (Shumway Cook & Woollacott, 2007). The arm is part of every human function and its loss interferes with independence, social interaction and personal identity. Thus when upper limb activity is disordered there is requirement for knowledge to identify and develop interventions which will address the subsequent disruption to function.

Recovery of the upper limb presents distinct problems; in part this relates to the complexity of its structure. It's function of placing and shaping the hand requires high levels of coordination and balance between areas of stability and mobility. Anatomically this range is provided by the "virtual" connection between the thorax and the scapula, limited bony integrity of the glenohumeral joint and complex interaction between the radio-ulnar joints and the wrist. The many joints and intrinsic muscles of the carpus and hand provide dexterity and the saddle joint of the thumb creates the uniquely human grasp and manipulative skills. Even basic function of the upper limb requires complex interaction of joint movement and coordination of muscle activity (Cirstea *et al*., 2003).

However, this complexity has negative consequences after stroke. Not only is the upper limb subject to poor recovery through reduced direct or indirect

use by the client themselves, including learned non-use (Liepet *et al*., 2000; Nudo, Plautz & Frost, 2010) it is also vulnerable to damage because of its design and position in relation to gravity and trunk movement. Many people experience post – stroke shoulder pain and even with treatment only a small proportion recover the use of their arm (Dobkin, 2004; Pizzi *et al*., 2005; Markus, 2008; Muir, 2009; Laver *et al.,* 2012; Intercollegiate Stroke Working Party: Royal College of Physicians (ISWP: RCP, 2012).

Loss of movement and reduced sensation and awareness of the upper limb result from stroke limit personal and social interaction and participation (Shumway Cook & Woollacott, 2007). The strategic position of the arm in relation to vision serves to emphasize its loss. Indeed, repeated “pulling” to re-positioning the limb where it can be seen and incorporated within awareness of their body by the person who has had stroke might contribute to post-stroke shoulder pain. These issues need to be addressed when considering interventions.

Interventions for the upper limb affected by stroke

Physiotherapists are key frontline professionals in developing and implementing interventions for people with stroke. Changes in health and social care and education of practitioners in addition to the burgeoning ageing population and social demographics have influenced the perspectives of practitioners in addressing approaches to stroke and the upper limb. These include:

- Increasing knowledge about the normal activity of the central nervous system in the control of movement and the effect of injury to specific areas (Cramer, 2008; Ganguly, Byl & Abrams, 2013).
- Changes in health and social care policies emphasising the importance of inclusion of any individual in decisions which affect them (Department of Health, 2012).

- Change in education; physiotherapy practice is now based on graduate “education” emphasising the rationale and evidence supporting decisions (Moffatt, 2012).
- Changes in funding for health care, reduction of the “medical power base” which supported Allied Health Professions practice (Marshall, Charlesworth & Hurst, 2014).

Physiotherapy graduates have skills of critical review of research publications, are confident and vocal about questioning rationale and wish to be involved in developing, exploring and answering questions which are clinically relevant. The number of physiotherapists who hold pre or post registration Master’s degrees and doctorates has increased; although these higher qualifications may be a route out of clinical contact into managerial, academic or research posts.

In addition, changes in the way that health care is delivered require physiotherapy to be person specific, goal orientated and cost effective. This is a huge remit and one which the current level and type of research evidence cannot fully answer. In addition, justifying decisions about the content and delivery of physiotherapy is complicated by the participatory aspect of practice; treatment is not “to” people but “with” them. Thus although there is a need to be person specific, and graduates have greater ability to critique extant research, there is in fact a lack of research that addresses these pertinent issues. This thesis, through a series of sequential studies, will seek to explore such issues of practitioners’ perspectives regarding selection of interventions, what influences these decisions and how the client is involved in the process.

There are aspects of existing research which limit translation into practice despite the recommendations of stroke guidelines, although the guidelines acknowledge the sparseness and flaws of the available supporting evidence (Intercollegiate Stroke Working Party: Royal College of Physicians (ISWP: RCP), 2012; National Institute of Health and Care Excellence (NICE), 2013).

Although there may be lack of evidence from clinical trials these treatments have been subjected to “peer review” demonstrated by their continued use (albeit with adaptation). Physiotherapists’ acknowledge the need for further research to identify the scope and efficacy of treatments but information about the rationale supporting current clinical decisions is limited. If more is known about how therapists’ select and deliver interventions for the upper limb after stroke, then existing practice can support research and vice versa. This approach is consistent with the original definition of “evidence based practice”.

Evidence based practice

One of the most important changes in health care delivery over the past decade has been the explicit requirement for professionals to demonstrate that they have prescribed the most effective treatment. This is achieved through providing “evidence based practice”.

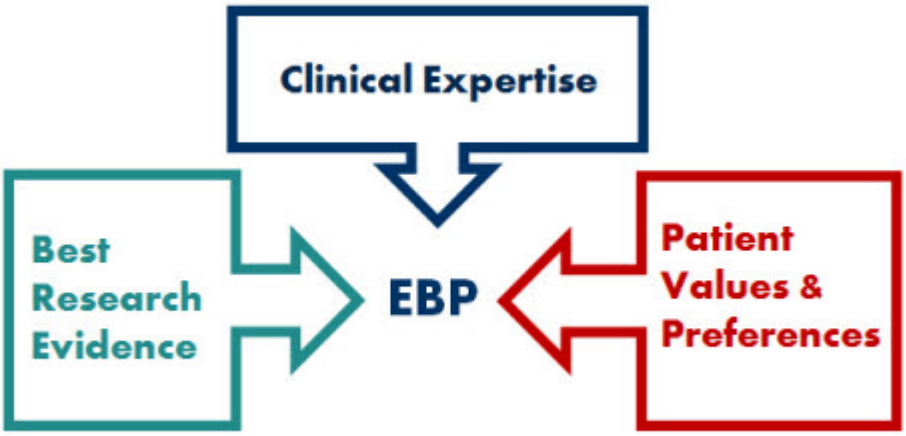
This term suggests that the highest level of clinical practice could be achieved through:

> “The conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research.” (Sackett *et al*., 1996).

This concept was identified initially with regard to the medical profession; Sackett (2002) further emphasised that EBP is the **integration** (the emphasis of the current study) of clinical expertise, patient values, and the best research evidence into the decision making process for patient care. This integration is important; it includes all participants and acknowledges the context within which the decision is taken: “Clinical expertise refers to the clinician’s cumulated experience, education and clinical skills. The patient brings to the encounter his or her own personal preferences and unique concerns, expectations, and values”. The best research evidence is usually

found in **clinically relevant** research that has been conducted using sound methodology (Sackett, 2002). See Figure 1

Figure 1 Components of Evidence Based Practice (Sackett *et al*., 1996; Sackett, 2002)



However, despite the explicit inclusion of both the expertise of the clinician and the values and priorities of the client there has been growing pressure on clinicians to base their decisions primarily on research evidence (NICE, 2013; ISWP: RCP, 2012). Although most clinical staffs have access to primary research papers there is robust evidence to suggest that there are barriers to its direct application to practice (Iles & Davidson, 2006; Metcalfe *et al*., 2010). Thus much of the support is drawn from amalgamated reviews; with respect to stroke these include ISWP: RCP (2012) and NICE (2013) guidelines and Cochrane reviews (Ada, Foongchomcheay & Canning, 2005; Sirtori *et al*., 2009; Winter *et al*., 2011). While these are useful documents those with the expertise to review the literature are academics, not clinicians and especially with regard to Allied Health Professions often the review panels are led by medical experts rather than physiotherapy experts. Thus the opinions of the clinician and the client, which were equally weighted in the original model (Figure 1), have been marginalised. The current study will fully involve the views of the clinicians and clients (in Phases 2 and 3) and address this gap in the extant literature.

Thus, Evidence Based Practice is used as a supporting paradigm in the current study; this includes identifying clinical questions derived from discussion with expert clinicians (about what they are doing and why). Consequently, research is interpreted in context with the opinions of clients with future practice fully embracing the concept of evidence base practice based upon rigorous research.

Recent research acknowledges the need to define practice terms and content and to continue to engage in research to establish the efficacy and parameters of current areas of practice (Gassaway *et al*., 2005; Ceiza & Bickenbach 2014; Djikers *et al*., 2014; Fasoli & Chen 2014; Hart *et al*., 2014a & 2014b). This is especially true of rehabilitation after stroke; much of the supporting theory has been derived from other areas of research and animal models (e.g. neuroscience, sports science), specific interventions have been explored in trials which bear little relation to current clinical applications and cannot be applied within current practice context (staffing, resources, environment) (Iles & Davidson, 2006; Metcalfe *et al*., 2010). This emphasises the importance of the inclusion of clinician views which will be explored in the current study.

Clinicians are bombarded with information with the directive that it should influence their practice, but many of the reviews also conclude that the supporting evidence is mixed. Issues are frequently identified regarding imprecise description of protocols or methodology; populations are often too small to provide reliable outcomes or mixed with regard to diagnosis (Iles & Davidson, 2006; Metcalfe *et al*., 2010). Despite the intent for researchers and expert clinical practitioners to work in association with people with experience to initiate relevant questions and apply the findings this is not apparent in current publications.

However, there is reason for hope: physiotherapy has been an all graduate profession since 1994 (Moffatt, 2012). Despite the relative newness of its academic credibility an increasing number of graduates have the skills and the interest to engage in research and changes in social and political

awareness support the need to include clients' in decisions about all aspects of health care provision.

As such the physiotherapy profession has developed some work to define interventions (Tyson & Selley, 2006; Donaldson, Tallis & Pomeroy, 2009; Tyson, *et al*., 2009) so that future research is based on accurate terminology. Therefore, with the evolving changes in the profession, the ever changing landscape of health care it becomes essential to provide an evidence base. However, many fundamental questions remain unanswered. In order to elucidate best practice, it is necessary to understand what influences clinical decision making. Thus the overall research question for the current study is as follows:

Research Question

What are the influences affecting physiotherapists during the selection and delivery of interventions for the upper limb after stroke and what are their perspectives regarding these?

In order to elucidate the components of the overarching research question, a number of other questions will be explored. The movement problems which therapists consider they treat most frequently and the interventions they commonly employ will be established. Internal and external factors (age, education, postgraduate training, and service structure) which may affect these perceptions will be identified. The content and process employed by therapists' during assessment and analysis of findings will be explored in relation to their perception of key features of neurological pathology and movement. Finally, interaction and rationale between the analysis of assessment findings, selection of intervention and delivery of intervention will be considered.

Phase 1 aims

To describe the effect of stroke on motor control of the upper limb reported by participant physiotherapists and to identify the treatment options from which physiotherapists reported that they selected.

To consider internal and external factors related to the experience and beliefs of the physiotherapists which might influence these issues.

Phase 1 objectives

1. To describe the structure of physiotherapy clinical practice for the treatment of individuals who have sustained stroke.
2. To describe physiotherapy post registration training and continuing professional development related to physiotherapy treatment of the hemiplegic upper limb after stroke.
3. To describe the type and frequency of occurrence of problems affecting motor control of the hemiplegic upper limb after stroke reported by participant physiotherapists.
4. To identify physiotherapy treatment options for the hemiplegic upper limb after stroke and identify the frequency of their use reported by participant physiotherapists.
5. To investigate if there is a relationship between clinical experience (length of time in neurological practice) and reported physiotherapy practice for the hemiplegic upper limb after stroke (identification of the frequency of occurrence of specific movement problems and the frequency of use of specific interventions).

Phase 2 aims

To explore the process through which therapists collect data about movement after stroke and the rationale underpinning their selection of treatment options.

Phase 2 objectives

1. To describe the assessment process through which therapists collected information about movement of the hemiplegic arm after stroke.
2. To explore the rationale which therapists employed in order to identify and understand key components related to movement of the hemiplegic arm after stroke.
3. To explore the rationale which therapists employed in order to formulate decisions about treatment for the hemiplegic arm after stroke.

Phase 3 aims

To explore the process of selection and delivery of interventions to address movement dysfunction for the hemiplegic upper limb after stroke from the perspective of the client and the therapist.

Phase 3 objectives

1. To explore the rationale which therapists employed in order to identify and understand key components related to movement of the hemiplegic arm after stroke during delivery of therapeutic intervention.
2. To explore the rationale which therapists employed in order to formulate decisions about treatment for the hemiplegic arm after stroke during delivery of therapeutic intervention.
3. To explore decisions in relation to selection and delivery of the therapeutic intervention from the perspective of the client.

Design and overview of the thesis.

In order to achieve these objectives, the study was designed in three sequential phases; these are outlined in chapter two (methodology).

1. Phase 1 will consist of a specifically designed survey to describe physiotherapy clinical practice for treatment of stroke and internal and external factors which might influence the content of physiotherapy interventions.

2. Phase 2 will consist of interviews to explore the processes through which therapists collect data about clients' movement of the hemiplegic upper limb after stroke and the rationale underpinning their selection of treatment options.

3. Phase 3 will consist of interviews to explore the processes of selection and delivery of interventions to address movement dysfunction of the hemiplegic upper limb after stroke from the perspective of the client and the therapist following the viewing of a videotape.

The above will contribute to knowledge by exploring the process through which chartered physiotherapists collect and interpret information about movement of the hemiplegic upper limb after stroke. Further, this project will contribute to knowledge regarding the process through which chartered physiotherapists select and combine interventions and work with clients after stroke to deliver packages of treatment. This will contribute to understanding of physiotherapy clinical practice for this client group and the extant evidence base.

CHAPTER 1: Review of literature.

Section one: Stroke incidence, presentation and mechanisms of recovery

1 Introduction to literature review

1.1 Stroke definition and incidence

Stroke is defined as:
"A clinical syndrome of focal (or global) neurological impairment of rapid onset, and lasting more than 24 hours (or leading to death), and of no apparent cause other than vascular origin" (World Health Organisation, 2005:4).

In the United Kingdom (UK) stroke is the third most common reason for death, after cancer and heart disease (Carroll *et al*., 2001; Markus, 2008) and the leading cause of long-term neurological disability (Wolfe, 2000). Incidence is between 1.33 and 1.58 per 1000 head of population (Saka, McGuire & Wolfe, 2009; Townsend *et al*., 2012); 150,000 people in England and Wales sustain stroke every year, of which 50,000 prove fatal (Carroll *et al.*, 2001). Further strokes are common; a quarter of individuals have a second stroke within 5 years, a third within 10 years (Mohan, *et al.,* 2011).

1.2 Impact of stroke

A quarter of stroke sufferers die within 6 months (Stone, Allder & Gladman, 2000; Vaugnat & Chantraine, 2003) and there are personal and financial consequences for those who survive. One year after stroke only 65% of sufferers live independently (Scottish Stroke Care Audit 2005/2009; British Heart Foundation, 2009). More than 300,000 people in the UK experience disability (Adamson, Beswick & Ebrahim, 2004), 200,000 of whom need assistance from professional carers or family members (Saka, McGuire & Wolfe, 2009).

Motor impairment and limitation in daily activity are associated with low perceived quality of life (QoL) which may persist long term (Visser-Meily, *et al*., 2005; Kwok *et al*., 2006; Horgan *et al*., 2009). Kwok *et al*., (2006) found Health Related Quality of Life (HRQoL) deteriorated between three and 12 months after stroke despite consistency in physical aspects of QoL. Horgan *et al*., (2009) observed in a study of n=23 participants that despite considerable improvement in function between six and 12 months no participant approached their pre-morbid functional status and suggested that this may contribute to low perceived QoL.

In addition to the personal cost of stroke there are financial implications for the UK National Health Service (NHS). Service developments including: early recognition, rapid access to brain and cardiac scanning and initiation of medical interventions (Intercollegiate Stroke Working Party (ISWP): RCP guidelines, 2012) have increased the number of individuals surviving stroke and thus demand on the UK economy. Saka, McGuire & Wolfe (2009) estimated the cost of stroke to the UK to be £9 billion (5% of total UK expenditure on health care). This related to direct treatment, the cost of care for the 200,000 surviving individuals (£2.5 billion) and loss of productivity due to death and disability (£1.5 billion).

1.3 Clinical features of stroke

Three stroke sub-types are acknowledged; ischaemic stroke (accounts for 80% of stroke in white populations), primary intra-cerebral haemorrhage (15%) and subarachnoid haemorrhage (5%) (Markus, 2008).

Stroke presentation relates to the site and magnitude of neurological damage (Feydy *et al*., 2002; Amarenco *et al*., 2009). Reduced activity in one area depresses synaptic activity in associated neuronal networks and consequent de-afferentation (diaschisis) affects areas remote from the original lesion. This phenomenon contributes to overall central nervous system limitation (Feeney & Baron, 1986; Meyer, Obara & Murumatsu, 1993), although this plastic capacity may also support recovery (Small *et al*., 2002).

Stroke affecting the internal capsule or corticospinal tract may result in hemiparesis and sensory loss affecting the contralateral face, arms and/or leg. Effects of stroke on vision include deviation of gaze and contralateral homonymous hemianopia (Markus, 2008; Muir, 2009). Speech and language disorders resulting from damage to the dominant hemisphere include fluently articulated speech with disordered content and reduced comprehension (Wernicke's area) and/or production of slow and non-fluent speech (Broca's area) (Skipper *et al*., 2007). Visuospatial neglect is demonstrated by failure to recognize simultaneous bilateral touch or visual stimuli, apraxia of eye opening, unawareness of the neurological deficit and inability to recognize the affected side (Markus, 2008; Muir, 2009).

Thus, altered motor control and sensation of the hemiplegic upper limb may result from haemorrhage or occlusion (total or partial) of the anterior cerebral circulation or deeper brain areas supplied by the smaller penetrating arteries (lacunar stroke). The effect on motor control and upper limb function may exist in isolation or in combination with loss of lower limb control, reduced ability to express or process language and gesture, altered vision, reduced memory or impaired decision making (higher executive functioning).

1.4 Effect of stroke on the upper limb

Although the majority of stroke survivors regain some ability to walk (Nakayama *et al*., 1994; Dobkin, 1998; Kwakkel, Kollen & Wagenaar, 1999), upper limb recovery is more limited (Dobkin, 2004; Pizzi *et al*., 2005; Markus, 2009; Muir, 2008; ISWP: RCP, 2012). Altered upper limb function is experienced by 70% of individuals immediately after stroke, 40% have persistent lack of function in the hemiplegic arm (Laver *et al.,* 2012). Changes in muscle activity following stroke were linked with altered joint position and poor movement. This complicates rehabilitation and reduces functional recovery of the arm (Lo *et al*., 2003; McClean, 2004).
Studies of goal directed reaching following stroke identified a reduction in speed and coordination of movement of the upper limb (Micera *et al*., 2005). This was linked to weakness (Tyson & Selly, 2006), abnormal postural tone

(Rodgers *et al*., 2003), abnormal movement synergies (Rohrer *et al*., 2002; Cirstea *et al*., 2003), altered movement between shoulder girdle structures (Kebaetsie *et al*., 1999) and altered timing within the movement pattern (Rohrer, 2002). Motor patterns are also affected by sensory alteration/loss; reported prevalence varies but is estimated to affect up to 80% of stroke survivors (Broeren, Rydmark & Sunnerhagen, 2004; Demain *et al*., 2013). Compensatory strategies used by stroke survivors to achieve function included altered kinematics (Rohrer *et al*., 2002; Micera *et al*., 2005), increased trunk recruitment (Roby-Brami *et al*., 2003) and fixation of specific body segments (Cirstea *et al*., 2003).

Animal studies demonstrated that reduced use of the paretic limb triggered reorganisation (plastic adaptive changes) of the primary somatosensory cortex (Nudo, Wise & Sifuentes, 1996). Tuke (2008) demonstrated this effect in stroke survivors and termed it “learned non-use phenomenon”. Altered motor control resulted from secondary effect rather than primary damage however it contributed to reduced function.

1.5 Mechanisms of recovery after stroke

Studies demonstrated that learning is supported by structural changes in the normal animal and human brain (neuro- plasticity) (Ward, 2005). Animal models in which focal damage is deliberately inflicted have shown plastic adaptation in both the area surrounding the lesion and distant brain regions (Schallert *et al*., 2000 cited in Ward, 2005). Proteins associated with development of infant and adolescent systems but not usually present in the adult brain are re-expressed and provide biochemical support for neuronal growth, apoptosis, angiogenesis and cellular differentiation for weeks or months following injury (Cramer & Chopp, 2000). Structural changes also occur; there is evidence for increased dendritic branching and generation of new synapses (Cramer, 2008). Increases in cortical synaptic excitability (secondary to a reduction in sensitivity to GABAergic inhibition) are thought to induce long term synaptic potentiation which is associated with learning (Hagemann *et al*., 1998).

Recent studies employed positron emission tomography (PET), functional MRI (fMRI) and transcranial magnetic stimulation (TMS) to examine brain activation during functional tasks. Comparison of stroke survivors with non-hemiparetic control groups demonstrated increased activation in brain regions related to motor control (Calautti & Baron, 2003). Following damage to the primary motor system projections from other parts of the brain (especially the supplementary motor area, dorsolateral premotor cortex and cingulate motor areas) to both the spinal cord and the primary motor cortex may support recruitment of secondary motor regions. Such projections are less numerous and less efficient at exciting spinal cord motor neurons therefore other areas within the remaining network assume new or extended roles (Maier *et al*., 2002).

The premotor cortex in particular has been shown to adopt functional characteristics of the primary motor cortex after subcortical stroke (Ward *et al*., 2003) however the degree and site of extended activation appears to relate to the magnitude of damage. The premotor cortex ipsilateral to the lesion is associated with therapy induced improvement in upper limb movement (Cramer & Chopp, 2000) and demonstrates increased activity in those who make a good recovery. Conversely recruitment of the contralesional premotor cortex is associated with greater impairment and poorer recovery; however, the relationship is unclear.

Recovery of function correlates with the degree of recovery in the ipsilesional primary motor cortex. However, the influence of the contralesional primary motor cortex is less clear (Ward, 2005). Nelles *et al*., (1998) identified greater activation of the contralesional primary motor cortex during task execution in long term stroke patients, especially for those with poorest outcome. This may be because the contralesional motor cortex inhibits activity of the ipsilesional cortex and thus limits recovering motor function in patients with subcortical stroke rather than because it supports ipsilesional cortical activity.

In summary, after stroke the altered functional cerebral architecture is less effective than that in the intact brain, but will nevertheless generate signals to

spinal cord motor neurons in the most efficient way possible (Ward, 2005). Involvement of both non-motor and contralesional motor areas have been consistently reported after stroke. Research suggests that more recovery is demonstrated if there is greater involvement of the ipsilesional motor network. This is relevant to physiotherapists because current research relates this pattern of recovery to motor training (Calautti & Baron, 2003).

Section two: motor control, physiotherapy treatment paradigms and current physiotherapy practice

1.6 Understanding movement

1.6.1 Motor control

Motor control is “ability to regulate or direct the mechanisms essential to movement” (Raine, Meadows & Lynch-Ellerington, 2009: 26). Features of motor control have been studied from the perspective of neurophysiology (reflex control theory, hierarchical CNS theory), movement science (motor programming theory, systems theory, degrees of freedom (Bernstein) and psychology (dynamical action theory) in order to develop explanatory models. Despite considerable work a definitive model remains elusive (Shumway Cook & Woollacott, 2007).

The central nervous system is thought to monitor and integrate stimuli and control motor output via a complex system of neuronal circuits connected in parallel and series (Shumway Cook & Woollacot, 2007; Kandal *et al*., 2013). The systems model proposed by Shumway-Cook & Woollacott, (2007: 28) relates movement to context. Individuals generate movement appropriate to meet the demands of the task being performed in a specific environment. Details of factors which inform and constrain each element are outlined in Table 1.1 below

Element	Factors constraining movement	Description
The Individual	Action	Motor output: coordination of muscles and joints, (degrees of freedom)
	Perception	Integration of sensory impressions into psychologically meaningful information
	Cognition	Establishment of intent or goals: attention, motivation, emotions
The Task	Discrete/ continuous	Task has/has no recognisable starting and finishing point
	Stability mobility	Base of support is stationary or moving
	Manipulation continuum	Balance between speed and accuracy required in manipulation of an object
	Attention continuum	Simplicity or complexity of the attentional demand
	Open/ closed	Task-environment interaction: the more “open” the environment the greater the degree of variability and flexibility required of the movement in order to complete the task
The Environment	Regulatory	Environment constrains the task e.g. size, shape and weight of a cup
	Non-regulatory	Environment affects but does not constrain the task e.g. lighting or noise

Table 1.1 Features of motor control (Shumway-Cook & Woollacott, 2007 pp. 2-8)

Neural mechanisms integrating posture and movement are recruited in patterns specific to task and context. Internal models (sensori-motor maps) support neural control of anticipatory adjustments during the development of skilled movement (Kandal *et al*., 2013).

Skilled motor control of muscles and joints requires precise temporal coordination which is developed through repetition and influenced by visual,

vestibular and somatosensory information. The internal representation of body posture (“schema”) constructed provides a basis for all interactions involving perception and action towards the external world. This is thought to be partly genetic and partly acquired through experiential learning. It is therefore adaptable and updated dependent upon the information which it receives.

Postural body schema consists of:

- Alignment of body segments relative to each other and the environment
- Movement of the body segment in relation to the base of support
- Orientation of the body in relation to gravity

Postural control mechanisms anticipate and accompany movement and occur during unexpected postural perturbations (Shumway Cook & Woollacott, 2007) these include:

- Balance strategies
- Patterns of movement
- Speed and accuracy
- Strength and endurance

1.6.2 Motor Learning

Motor learning based on neural development associated with practice or experience leads to a relatively permanent change in the capability or skills producing action (Shumway Cook & Woollacott, 2007). Principles of motor learning include active participation, meaningful goals and opportunities for practise which is meaningful, variable and specific to context (Holder & Hosterbach, 2001).

Research further identifies that motor learning has two aspects: implicit learning requires less conscious control, relates to the integration of

sensorimotor information and involves parallel processing of information generated by many parts of the brain. In contrast explicit learning includes factual information and conscious high level cognitive functions in specific areas of the brain. Supporting the value of coaching and feedback identified in physiotherapy after stroke.

1.6.3 Upper limb movement control

Upper limb functions include: balance, support, strength, dexterity, stereognosis, manipulation, communication and sensory exploration of the environment (Raine, 2006). These are dependent upon interaction between postural control, dynamic balance and selective goal orientated movement of the arm and the hand (Raine, Meadows & Lynch-Ellerington, 2009). This in turn requires integrated and coordinated interaction of the articular, myofascial and neural systems of the body (Mottram, 1997).

One of the fundamental actions of the upper limb is reaching and placing the hand in contact with an object for function. This requires integration of visual information with upper limb activity to coordinate movement of the eyes, head and trunk. Complex mechanisms supporting this include, target location and stabilising of gaze during movement of the body and/ or the arm, head and trunk (Shumway Cook & Woollacott, 2007).

Upper limb sensation contributes to the neuronal circuit linking object perception/ recognition and object localization. If sensation is reduced and vision occluded reach accuracy and coordination are poor and deteriorate with repetition. This may explain the phenomenon and impact of learned non-use (Nudo, 2010).

Movement components of reach and grasp are controlled separately by the brain (Shumway Cook & Woollacott, 2007). Hand shaping for grasp is concurrent with reach; the maximum aperture required for specific grasp is complete within 75-80% of the movement duration. Accurate reaching requires task specific differences in timing and velocity; complicated

movements are slower. This results from reducing acceleration (velocity or length of phase) and increasing deceleration in order to attain greater precision. Ipsilateral reaching is smoother and more accurate than across body (contralateral). Thoracic spine mobility is required to relate movement of the upper body to orientation of the upper limb and therefore placement of the hand (Shumway Cook & Woollacott, 2007).

Grasp shape (size of aperture, finger orientation) requires specific alignment of the upper limb, especially the forearm, wrist and hand. This is directed by function and based on perception of object features including size, weight, shape and texture. Power functions (power and hook grips) require application of force into the palm of the hand to provide stability. Precision grips (pinch and lumbrical) employ force applied between digits (especially the index finger) and thumb. Stability recruited through muscles of the ulnar side of the hand releases the thumb and index fingers for manipulation (Shumway Cook & Woollacott, 2007; Raine, Meadows & Lynch-Ellerington, 2009; Carr & Shepherd, 2010).

1.7 Motor control and motor learning theory informing physiotherapy

Control of single or multiple components associated with upper limb movement, balance, reach, grasp and manipulation are affected dependent upon the site of the stroke (Wardlaw, 2004; Muir, 2008; Amarenco *et al*., 2009; Markus, 2009).

Rehabilitation addresses those components in isolation and through functional combinations. These include bilateral and unilateral arm activities, symmetrical and asymmetrical movement combinations across and away from midline (Shumway Cook & Woollacott, 2007; Raine, Meadows & Lynch-Ellerington, 2009; Carr & Shepherd, 2010). Treatment requirements include increasing stability of the wrist, ensuring adequate length and pliability of muscle and soft tissue to permit shaping of the palm and positioning of digits for precise hand activities involving grasp, manipulation and release

(Shumway Cook & Woollacott, 2007; Raine, Meadows & Lynch-Ellerington, 2009; Carr & Shepherd, 2010).

Upper limb function is based on vision, sensation and object recognition therefore treatment should include coordination of eye, head and hand movement. This requires control of the cervical spine for vision, the thoracic spine for scapula stability and the lumbar spine for trunk orientation (Shumway Cook & Woollacott, 2007; Raine, Meadows & Lynch-Ellerington, 2009; Carr & Shepherd, 2010).

1.8 Physiotherapy rehabilitation paradigms

Several approaches provide a supporting framework for physiotherapy in neurological rehabilitation (Raine, 2006). These include the Bobath concept (neuro developmental approach) based on neurophysiological theory and guided practice and the "Motor Re-learning approach" which emphasises repeated practise and task related training (Chan, Chan & Au, 2006; Langhorne, Coupar & Pollock, 2009; Langhammer & Stangelle, 2011). A third smaller model exists which has been termed an "orthopaedic approach" (Chan, Chan & Au, 2006; Oujamaa *et al*., 2009; Langhammer & Stangelle, 2011). This includes addressing joint mobilization and limb strengthening and may be a sub-set of the other approaches.

The intention of this study is not to compare and contrast the paradigms; it can be seen from the section below that there are considerable areas of overlap. However, as the study focuses on decisions made about clinical practice the content associated with the two dominant paradigms is summarised.

1.8.1 The Bobath concept

Interventions based on the Bobath concept integrate postural control and task performance related to a "systems" model of motor control (Raine, 2006; Graham *et al*., 2009). Treatment consistent with this model addresses

postural control and elements of specific voluntary movement including improving synchronisation of muscle activation and increasing strength, power, endurance and coordination. Therapists aim to normalise background muscle tone and increase integration of sensory information to improve body awareness in relation to internal body schema and external environmental factors.

Treatment also includes the use of modified task-directed movement in order to allow current participation and limit impact on future function. Therapists are advised that treatment should also address cognitive, emotional and behavioural factors to support task-related problem solving. A further proviso is that intervention should include core strategies to limit the long term impact of neurological dysfunction and promote optimum posture and movement over every hour, every day (Raine, Meadows & Lynch-Ellerington, 2009).

Key areas of treatment based on the Bobath concept are the use of specific handling techniques to facilitate normal movement patterns. This is termed “facilitatory handling” and is modified as independent control is acquired. Assessment and treatment are ongoing; the individual’s response is continuously evaluated in order to adjust goals and amend the treatment plan.

1.8.2 The Motor Relearning Process

The “Motor (re)learning process” is based on evidence from clinical trials and systematic reviews related to motor learning. Neuro-physiological theory supporting improvement of normal motor function through training was interpreted and applied to (re)establishing motor skills following central nervous system damage. The training programme focussed on repeated performance of a functional task; there is less emphasis on the motor strategies used (Carr & Shepherd, 2002).

Interventions based on the Motor (Re)learning Process involve stimulating neuroplastic adaptation through intensive repetition of motor tasks which are meaningful to the client (Carr & Shepherd, 2010). Therapists manipulate the context in order to influence features including strength, endurance, eccentric and concentric muscle activity, and trunk and limb relationship/alignment within base of support. There is belief that rehabilitation should increase muscle strength, endurance and aerobic fitness for general wellbeing and participation in daily life. The physiotherapist's role includes providing feedback, improving and preventing and physical limitations to movement (e.g. muscle shortening) and designing contextually relevant opportunities for repeated practice (Carr & Shepherd, 2010).

Theoretical beliefs central to Motor (Re)learning Process are that components of postural control (muscle activations and stabilising segmental movements) are specific to the action being carried out within that environmental context. Also that sensory stimulation of areas relevant to an action is achieved only during the task. Thus strength training and sensory stimulation is specific to the context in which an exercise is performed (Miller et al., 2006; Lee *et al*., 2008).

Treatment based on the Motor (Re)learning Process advocates that clients should practise specific task related actions under conditions of similar dynamics (environment and speed of movement) as those for the everyday actions which they must relearn. Treatment environments may require modification to allow achievement and avoid compensation (for example selection of appropriate chair height, supporting upper limb on a table to allow working on elbow control) (Carr & Shepherd, 2010).

1.9 Limitations of research related to physiotherapy after stroke

Neurological pathology is complex; symptoms or degree of motor impairment relate to stages of disease progression or recovery (Albert & Kesselring, 2012). Other medical conditions resultant from age or co-morbidity may require adaptation of techniques to the individual (Partridge & Johnston,

1989) or the environment (Langhorne, 1993). Additionally, setting treatment goals requires the therapist and client to determine the possibility of regaining selective movement or deciding if treatment should access compensatory movement to permit function (Partridge & Edwards, 1996; Lennon, 2003).

1.9.1. Lack of specificity in identification of treatment approaches and intervention content

Practice decisions for neurological therapists may be influenced by limited consensus regarding the merit and content of different treatment approaches (Earnst, 1990; Partridge & De Weerdt, 1995; Ashburn, 1997).

The Motor (re)learning Process and the Bobath concept consider the importance of neuroscience related to motor control and the value of task related practice (and repeated practise) (Carr & Shepherd, 2002; Luke, 2004; Krakauer, 2005; Raine, 2006, Graham *et al*., 2009; Carr & Shepherd, 2010) but with different emphasis and clinical interpretation. The Bobath concept gives greater emphasis to the importance of anticipatory postural adjustment and sensory aspects of motor control (including therapists' physically influencing sensory integration and execution of components of motor control by "facilitating "aspects of the movement) and the motor re-learning process places greater emphasis on repeated task or environment specific practice with patient initiated correction resulting from experiential learning through movement (Carr & Shepherd, 2002; Oujamaa *et al*., 2009; Carr & Shepherd, 2010).

In addition to overlap between these paradigms, evidence suggests that although therapists claim to base treatment on a specific approach their interventions are adapted and synthesised from numerous sources. Influences include: background, experience, knowledge, skills, personal preferences (Lennon, Baxter & Ashburn, 2001; Lennon, 2003; McGlynn & Cott, 2007) and the patients' abilities (Natarajan *et al*., 2008). Tyson *et al*.,

(2008) argue that therapists cannot determine which content relates to a named approach.

Despite this, researchers have explored the efficacy of these paradigms by comparing them (Langhammer & Stanghelle, 2003; Luke, 2004; Langhammer & Stanghelle, 2011). Findings suggest slight benefits from treatment based on the Motor Relearning Process but results are based on small studies and participant groups which may have had differences in initial movement. Clinical application of findings is limited (especially in studies which predate routine diagnostic scanning) by categorization which may not identify variation between patients with an identical diagnostic label (Marsden & Greenwood, 2005). Description of interventions considered consistent with each approach lacked detail and use of named but non-defined approaches makes it difficult to distinguish between them and assign effect (van Vliet, Lincoln & Robinson 2001; Edwards *et al*., 2004; Jette *et al*., 2003; Davidson & Waters, 2005). Consequently, such research lacks accuracy and may not reflect the range of interventions used in clinical practice (Pomeroy & Tallis, 2002; Steultjens *et al*., 2003; De Wit, *et al*., 2007).

1.9.2 Lack of research identifying how interventions are applied in clinical practice

Research to date explored the effect and efficacy of interventions based on acknowledged approaches but no data were available to describe the degree to which any specific intervention is used in physiotherapy practice for stroke. Standardising an intervention as part of a research study to evaluate its effect may compromise its clinical relevance and limit generalizability and application of the results derived (Richardson & Lindquist, 2010).

Determining the range and degree of use of physiotherapy treatments for the hemiplegic upper limb is hindered because characteristics of the applied interventions are poorly reported in research (Ashburn, Partridge & DeSouza, 1993; Sackley & Lincoln, 1996; Pomeroy & Tallis, 2002). Studies refer to interventions as “standard practice” or “enhanced practice” without

explanation of what is meant by these terms. It is acknowledged that clinically relevant interventions may be complex and diverse but the need for accurate description of practice content to be employed in future research is considered imperative (Marsden & Greenwood, 2005; De Wit *et al*., 2006; Donaldson, Tallis & Pomeroy, 2009).

Current descriptions fail to differentiate between treatments which differ but are commonly referred to by the same term, or between those which are similar but have different “labels”. Additionally, lack of content specification limits research to determine which aspect or component of an intervention is responsible for effecting clinical change (Ceiza & Bickenbach, 2014; Djikers *et al.*, 2014).

Pomeroy & Tallis, (2002) argue that at best inadequate differentiation limits the interpretation of research findings, at worst it may result in effective interventions being rejected because another intervention with the same descriptive label was found to be ineffective. Lennon (2003: 460) makes a further and important point which is endorsed by Donaldson, Tallis and Pomeroy (2009) and Tyson *et al.,* (2009) regarding “purity of practice”. In view of the number of therapists who appear to use principles from different approaches in their daily practice it may be more beneficial to identify the content of treatment interventions rather than to focus on investigation of “named” but poorly-defined approaches. This would support exploration of tangible components of physiotherapy in stroke rehabilitation to restore movement and function in terms of both effectiveness and cost to health services. A small number of researchers (Tyson & Selley, 2006; Donaldson, Tallis & Pomeroy, 2009) have developed treatment schedules which facilitate more accurate recording of clinical interventions and research protocols. Finally, research frequently considers the practice of physiotherapy in isolation but Allied Health Professionals work in clinical collaboration (De Wit, *et al*., 2007).

Thus, research to determine effective practice and to inform clinicians in decision making fails to achieve these objectives because of lack of accuracy

regarding physiotherapy context and content and lack of information regarding application of interventions.

The current study will address these issues by exploring the context and content of physiotherapy within treatment of the hemiplegic upper limb after stroke in phase 1 and the rationale related to selection, planning and delivery of interventions delivered as part of normal clinical practice in phases 2 and 3. Thus this study will increase existing knowledge regarding the process of selection between and delivery of interventions which will facilitate further research to determine efficacy.

1.10 Current physiotherapy practice in neurological rehabilitation

1.10.1 Objectives of physiotherapists

Despite variations in interventions (Lennon, Baxter & Ashburn, 2001; Lennon, 2003; Tyson & Selley, 2006) survey based and observational studies have suggested consistency in key theoretical beliefs and consensus of the overarching aims of physiotherapy after stroke (see Table 1.2) (Lennon, 2003; Tyson & Selley, 2006; Natarajan *et al*., 2008).

Aims of Neurological Physiotherapy
Promotion of normal movement patterns (including addressing muscle weakness and altered joint range),
Normalisation and control of muscle tone
Promotion of function
Recovery of movement with optimisation of compensation

Table 1.2 Theoretical themes underpinning physiotherapy practice in neurology (synthesized from: Lennon, 2003; Tyson & Selley, 2006; Natarajan *et al*., 2008.

However, there is a gap in knowledge about physiotherapists' perceptions of the value of specific treatment modalities and rationale for selection and mode of delivery of an intervention. Only a small number of studies identified specific interventions used in current clinical practice to treat the hemiplegic upper limb after stroke (De Wit *et al*., 2006; Donaldson, Tallis & Pomeroy, 2009) and further work in this area is imperative.

1.10.2 Treatment content

Those studies examining treatment of the hemiplegic upper limb were related to specific aspects of therapy. Edwards, Partridge & Mee (1990) and Chatterton, Pomeroy & Gratton (2001) considered prevention/relief of hemiplegic shoulder pain. Hunter *et al*., (2006) reported development of a template to record interventions for "mobilisation and tactile stimulation." More specific work was undertaken by De Wit *et al*., (2006) to define content of physiotherapy and occupational therapy for inpatient rehabilitation of sub-acute stroke and Donaldson, Tallis & Pomeroy (2009) to develop and validate a schedule to record physiotherapy treatment for the paretic upper limb after stroke.

Although De Wit *et al*., (2006) did not consider upper limb treatment specifically the content of physiotherapy interventions was identified in detail and included relevant information. Physiotherapists with extensive clinical experience in neurological rehabilitation reviewed literature and examined videotaped treatment sessions (physiotherapy and occupational therapy) from four European rehabilitation centres. Therapeutic activities included in physiotherapy and occupational therapy sessions for stroke patients were listed, reviewed by another group of experienced physiotherapists (n=5) and occupational therapists (n=5) and tested by two physiotherapist members of this group who used this list to score the verified therapeutic activity of a further series of 28 recorded treatment sessions at 20-second intervals. The list contained 53 mutually exclusive activities in 12 categories; inter-rater reliability was high for all categories (ICC, 0.96 to 0.99).

Donaldson, Tallis & Pomeroy (2009) compiled a list (schedule) of interventions to support communication of treatment content for the hemiplegic upper limb. This was intended for clinical and research purposes and the report outlines development of the schedule and testing for criterion and intra rata reliability. Authors acknowledged the small participant group (initial development, n=12; validation n=14) and geographical limitations of the study and suggested further assessment of schedule validity in different areas and with different stroke client groups before generalisation of the final version.

Experienced physiotherapists drawn from a range of London hospitals participated in both phases of the study. Purposive sampling ensured a range of practice and identification of various interventions. Data were collected via semi-structured interviews from which themes were extracted to compile a treatment list of possible interventions for a specified stroke client group.

Content analysis of interview transcripts was undertaken independently by two researchers. Their versions were compared and discussed to obtain resolution and the resultant list further discussed by the participants during a focus group in order to ensure accord. The draft schedule of treatments for this client subgroup was piloted by the same group of therapists in their clinical practice over a period of two weeks before final amendments were made. Thus the process provided several opportunities for participating therapists to review and refine their treatment suggestions.

A further group of senior therapists (n=10) used the final version in practice with 30 patients (three for each therapist). Sessions were video recorded and each therapist used the treatment ‘schedule’ to record the content of their own treatment and rate the adequacy of the descriptor using a visual analogue scale (VAS). This was repeated six weeks later to measure intra-rater reliability.

Expert validity for all descriptors (based on the VAS data) scored above the 95% confidence interval and intra-rater reliability (kappa) scored 0.81 for 95% agreement. The schedule contained 50 treatment items, 41 of these were used by the participating therapists during the 30 treatment sessions which comprised this study, which further demonstrates the relevance of the 'schedule' for this group.

Although Donaldson, Tallis & Pomeroy (2009) defined a stroke subgroup (anterior cerebral artery involvement, 3-12 weeks post stroke, no visuo-spatial deficit, able to follow 1 stage commands) their schedule provides a list of interventions which have criterion validity and intra-rater reliability and are considered appropriate for treatment of the upper limb. This schedule adds valuable information to identifying clinical interventions and in association with De Wit *et al*., (2006) provides descriptive terms and potential treatment content of interventions for clients after stroke. The current study aims to explore clinical decisions about upper limb treatment for clients after stroke and these supporting studies provide content descriptors for interventions already tested in practice.

The interventions identified by of De Wit *et al*., (2006) and Donaldson, Tallis & Pomeroy (2009) are summarised in Table1.3, highlighted areas were identified by both research teams.

Donaldson, Tallis & Pomeroy, 2009		**De Wit *et al*., 2006**	
Treatment activity descriptor	Treatment content	Treatment activity descriptor	Treatment content
Soft tissue mobilisation	**Massage,** Myofascial release	**Mobilization**	Stretching, Palpation (including pain assessment), Passive relaxation, **Massage**
Joint mobilisation		**Mobilization**	**Manual joint mobilization**
Facilitation of muscle activity /movement	**Mental activity**	Sensory, Perceptual training, Cognition	**Cognition**
	Patient generated cueing		
	Therapist generated cueing		
	Range of levels of assisting and facilitating movement	**Selective movements**	**Coordination, Active relaxation**
	Restricted use of non-paretic limb		
Specific sensory input	**Tactile, Proprioceptive,** Electrical	**Sensory, Perceptual training, and Cognition**	**Sensory, Perceptual training,**
Splinting		Stretching	
Strengthening		**Selective movements**	**Strengthening exercises**
Balance and mobility		**Exercises and balance in lying**	Lying, Weight bearing on elbows, Positioning and alignment

Donaldson, Tallis & Pomeroy, 2009		De Wit *et al*., 2006	
		Exercises and balance in sitting	Sitting, Protective reactions, Positioning and alignment
		Exercises and balance in standing	Standing, Practising stand, and swing phase
		Transfers	
		Ambulatory	Wheelchair handling/driving, Walking, Climbing stairs (with aid or therapist or independently)
Upper limb function		**Personal activities of daily living (ADL**)	
		Domestic ADL	
		Leisure and work-related activities	
Education for patient and carer			Not included
Other	Acupuncture, Ultrasound, Compression	Miscellaneous techniques	Not specified
			Pain assessment

Table 1.3 Treatment interventions for the upper limb (based on De Wit *et al*., 2006; Donaldson, Tallis & Pomeroy, 2009)

1.11 Government targets and Professional clinical guidelines

Following acute stage management medical interventions define appropriate pharmaceutical support required to limit risk of further stroke and treat effects

including altered muscle activity and pain (National Institute of Clinical Excellence, 2010: accessed on line 04.01.11).

Standards for treatment and rehabilitation after stroke published by The National Institute of Clinical Excellence and Royal College of Physicians stated that after stroke 90% of hospital stay should be on a designated stroke unit for treatment and support from a multi professional stroke-specialist team (National Institute of Clinical Excellence, 2010; ISWP: RCP, 2012). Physiotherapy is identified as a key aspect of rehabilitation following stroke. Standards require assessment by a physiotherapist within 72 hours of admission to hospital (Commissioning for Quality Innovation Stroke guidelines, 2012; ISWP: RCP, 2012).

Subject to patients' medical stability, need and tolerance in the acute phase following stroke a minimum of 45 minutes of each appropriate therapy should be offered. This should be continued for a minimum of five days weekly, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it (Kwakkel & Wagenaar, 2002; Kwakkel *et al*., 2004; ISWP: RCP, 2012).

Government policy and professional guidelines require that physiotherapy interventions are evidence based, functionally relevant and client centred. To achieve this client representative groups are involved in decision making about service provision and delivery at a National level. Physiotherapy education emphasises a problem solving approach and graduates review and question evidence in order to match their suggested interventions to the needs of specific clients (Chartered Society of Physiotherapy, 2002).

However further evidence of physiotherapy efficacy is needed to justify funding for existing and developing services (Albert & Kesselring, 2012; ISWP: RCP, 2012; Chartered Society of Physiotherapy, 2014). Current evidence for specific interventions is limited by the small scale of published clinical trials and lack of homogeneity of the stroke population. There is need for greater accuracy in measurement of severity of stroke, motor impairment,

and degree of recovery (Bovend'Eerdt *et al*., 2008; Lucca, 2009; Winter *et al*., 2011; Albert & Kesselring, 2012; ISWP: RCP, 2012).

Despite this a number of treatment modalities identified in research literature are supported by the recommendations of the Royal College of Physicians National Clinical Guidelines for Stroke (2012). Those applicable to rehabilitation of the hemiplegic upper limb are identified in Table 1.4.

Clinical presentation	Suggested intervention(s)	Supporting research
Sensory loss	Sensory retraining (using repeated active exposure to varying sensory stimuli or passively to electrical stimulation)	Carey & Matyas, 2005; Stolk-Hornsveld *et al.,* 2006; Carey *et al.,* 2011
Reduced aerobic fitness	Strengthening programmes	Meek *et al.,* 2003; Saunders *et al.,* 2004; Ada *et al.,* 2006; Pang *et al.,* 2006; Brazzelli *et al.,* 2011
Reduced strength	Strengthening programmes	Meek *et al.,* 2003; Saunders *et al.,* 2004; Ada *et al.,* 2006; Pang *et al.,* 2006; Brazzelli *et al.,* 2011
Reduced strength; Reduced function	Task specific training	Task Orientated Exercise van de Port *et al.,* 2007; Wevers *et al.,* 2009; English & Hillier 2010
Reduced strength; Reduced function	Repeated practise	Langhorne, Couper & Pollock, 2009
Reduced function	Bilateral arm use (Note: unilateral training may be the preferred intervention for mild arm paresis, bilateral training can be considered for moderate to severe arm paresis)	van Delden *et al.,* 2012.

Learned non-use	Constraint induced movement therapy (CIMT) (Note: should only be considered for people who have 20 degrees of active wrist extension and 10 degrees of active finger extension, and should only be started if the team has the necessary training and the patient is expected to participate fully and safely).	Wolf *et al.,* 2006 ; Page *et al.,* 2008
Increased muscle tone/Spasticity	Positioning, active movement and monitoring range of movement for deterioration of function, passive movement and pain control. (Note: the evidence base for splinting remains limited not recommended as a routine intervention)	Lannin *et al.,* 2007a; Royal College of Physicians *et al.,* 2009
	Persistent or progressing spasticity affecting one or two joints and for whom a therapeutic goal can be identified (usually ease of care / passive function) should be given intramuscular botulinum toxin in the context of a specialist multidisciplinary team service accompanied by rehabilitation therapy or physical maintenance strategies (e.g. splinting or casting) over the 2–12 weeks following botulinum toxin injection. Functional assessment	McCrory *et al.,* 2009; Royal College of Physicians *et al.,* 2009; Shaw *et al.,* 2011
Task specific training	Repetitive task training for the upper limb, (reaching, grasping and other functionally meaningful tasks.	Royal College of Physicians, 2012

Mental practice	Should be used as an adjunct to conventional therapy.	Zimmermann-Schlatter *et al.,* 2008; Page *et al.,* 2009; Barclay *et al.,* 2011
Shoulder pain/subluxation	Any patient who has developed, or is developing, shoulder subluxation should be considered for functional electrical stimulation of the supraspinatus and deltoid muscles.	Koyuncu *et al.,* 2010; Fil *et al.,* 2011
Neglect	Interventions aimed at reducing the functional impact of the neglect (e.g. visual scanning training, limb activation, sensory stimulation, eye patching, prism wearing, prism adaptation training), (Note: ideally within the context of a clinical trial.	Jehkonen *et al.,* 2006; Bowen & Lincoln, 2007; Ferreira *et al.,* 2011; Fong *et al.,* 2007; Luukkainen-Markkula *et al.,* 2009; Polanowska *et al.,* 2009; Schroder *et al.,* 2008; Tsang *et al.,* 2009; Turton *et al.,* 2009

Table 1.4 Interventions recommended as part of physiotherapy following stroke, (Albert & Kesselring, 2012; Royal College of Physicians, 2012).

Treatment interventions shown to be most effective are those utilising high-intensity, repetitive and task-specific properties, for example, constraint-induced motor therapy (CIMT) and bilateral upper limb training. There are limitations in applicability of CIMT because of the required level of hand and wrist function. Further the length of the period during which movement of the unaffected arm is constrained demands considerable patient compliance. The evidence base for virtual reality based interventions for the upper limb after stroke and robotic assisted upper limb movement is growing, but further research is needed (ISWP: RCP, 2012).

In a robust meta-analysis of literature published between January 1950 and April 2009, Harris and Eng (2010) reviewed quantitative studies about procedures for strengthening after stroke. Of 450 papers only 14 met the authors screening criteria (randomized controlled trials examining the effect or additional effect of a graded strengthening programme, confirmed diagnosis of stroke, adult patients, and evaluation of upper-limb strength, upper-limb function or ADLs). Despite stringent attempts to include robust trials those included ranged from two to eight on the PEDro scale and four trials were below a rating of five. This suggests reason for concern about the quality of the research literature available.

Reviewers identified variability between exercise type (isotonic, isometric) in the strengthening programmes and differences in the length of the treatment phase (standard was one hour/day, two to three days/week for four weeks). Upper limb strengthening programmes were compared against other treatment modalities including a lower-limb training programme, outpatient treatment and Neurodevelopmental (Bobath) techniques. Despite lack of consistency and limited description of progression of voluntary effort which restricted cross study comparison the results suggested that strengthening programmes addressing grip strength, upper limb strength, upper limb function and activities of daily living (ADL) improved upper limb function.

Other methods of providing upper limb resistance training are acknowledged in core physiotherapy texts. These include proprioceptive neuromuscular facilitation and use of resistance bands (Adler, Beckers & Buck, 2008; Stokes & Stack, 2013) although specific exercise protocols are not outlined.

1.12 Summary of section two

Despite limitations in demonstrating efficacy of specific interventions, existing work and professional guidelines suggest areas that physiotherapists should address within rehabilitation of the hemiplegic upper limb after stroke. This includes physiological features of neurological pathology such as altered tone, altered coordination/motor sequencing, reduced or altered sensation and pain. Therapy should address re-gaining optimum joint alignment, strengthening specific muscle groups, building motor endurance and power, coordinating unilateral and bilateral arm movement and limiting cardio-respiratory and musculo-skeletal deconditioning.

Additionally, physiotherapy may be delivered in association with occupational therapy in order to treat factors related to neglect, visio-spatial disorders and motor planning (apraxia) and with speech and language therapy in order to address head position, breath control, voice projection and power and sequencing of swallowing.

Section three: Clinical reasoning overview, models and influences informing neurological physiotherapy

1.13 Clinical reasoning

1.13.1 Decision making in clinical practice: definition

Terms to describe decisions taken by healthcare professionals to support clinical practices are used interchangeably (Thompson & Dowding, 2004; Jefford, Fahy & Sundin, 2011). These included: clinical reasoning, clinical

judgement, clinical inference and diagnostic reasoning (Thompson & Dowding, 2002; Jefford, Fahy & Sundin, 2011), problem solving and critical thinking (Gladstone, 2012).

Thompson & Dowding, (2004) suggested differentiation between assessing the value of alternatives (which they termed clinical judgment) and choosing between those alternatives (which they termed clinical decision-making). In contrast to clinical reasoning a clinical judgement might or might not be based on relevant clinical features or a systematic reasoning process (Jefford, Fahy & Sundin, 2011: 247; Gladstone, 2012).

However, these concepts are frequently considered to be related and "clinical decision making" embraces both clinical reasoning (basing diagnostic and treatment decisions on logical thinking) and clinical judgment (used to guide an action that is taken by a health professional in a clinical situation). Academics thus acknowledge that describing the process of decision making within a health care context is complex.

Standing (2007:66) proposed that it involved: observation, information processing, critical thinking and exercising clinical judgement in order to "select the best course of action in promoting and maintaining patient health". Higgs & Jones (2000) considered clinical reasoning a process through which "the therapist acting with the patient and others (including family members, carers), helps patients to structure meaning, goals and health management strategies". Edwards *et al*., (2004: 313) additionally identified that decisions are based on "clinical data, patient choices and professional judgment and knowledge". An important point was made by Buckingham and Adams (2000a; 2000b) that decisions made in and about practice are profession and speciality specific and research related to the strategies employed by clinicians should be interpreted from a contextual perspective.

1.13.2 Overarching theoretical models of clinical decision making

1.13.2.1 Normative, descriptive, prescriptive

In seminal work Bell, Raiffa and Tversky (1988) identified theoretical models of Clinical Decision Making categorised as Normative, Descriptive and Prescriptive. Normative theories supported decisions based on analysis of information and application of fundamental “laws”. Such decisions result from a logical and rational process intended to identify the “best” outcome from possible options. Descriptive theories considered cognitive capacities and limitations of individuals to process information. These explored the process through which a decision was made without ascribing “value” to the outcome. Prescriptive theories concerned the quality of decisions in practice and improving these by designing methods which incorporate “the insights gained from normative theories but in a way that recognises the cognitive limitations of the decision maker” (Bell, Raiffa & Tversky, 1988: preface page IX).

In health care all three processes are apparent in the use of information to support decision making of different professions (Cioffi & Markham, 1997). Medical model decisions are considered to be Normative; nursing practitioners commonly use approaches based on a Descriptive model and Prescriptive theory lends itself well to practice based learning and reflection on action (Cioffi & Markham, 1997; Thompson & Dowding, 2002; Hardy & Smith, 2008).

Historically physiotherapy decisions were supported by a medically influenced “diagnostic” model (Edwards *et al*., 2004: 313). Hypothetico-deductive reasoning is employed initially and a pattern recognition system is developed with increased knowledge and clinical experience. However, physiotherapy professional autonomy is thought to have influenced decision making and current practice acknowledges relationships between pathology, psychology and sociology (a bio-psycho-social model).

Consideration of context and clients' social and emotional interpretation of health (and for therapists the role of movement within this construct) entails new ways of examining and interpreting clinical data in order to support the prescription of physiotherapeutic intervention (Edwards *et al*., 2004). Physiotherapy after stroke is supported by the systems model of the central nervous system suggested by Shumway-Cook and Woollacott (2007) whereby therapy prescription reflects interplay between characteristics of the client, the task and the environment.

1.13.2.2 Hypothetico deductive reasoning and pattern recognition

Change in reasoning strategy is associated with context and transition from novice to expert practice. Thus, hypothetico-deductive reasoning which is associated with novice practitioners is refined through exposure to clinical presentations. Templates of "grouped information" provide cues for reasoning based on pattern recognition (Jensen *et al.*, 2000; Edwards *et al*., 2004) which may lead to the development of personal or professional heuristics (Cioffi, 2012). Characteristics are outlined in Table 1.5

Hypothethico deductive reasoning (type 2 decision making)	**Pattern recognition reasoning (type 1 decision making)**
Used by novice practitioners and experts in new situations	Used by expert practitioners in familiar situations
Deductive (abstract)	Intuitive (associative)
Slow, deliberate	Rapid, reflexive
Rule based	Heuristic, low scientific rigour, contextual
Rarely emotive	Can be emotive
Consistent reliable	Reliability is variable
Low vulnerability to bias	Higher vulnerability to bias,

Table 1.5 Features of clinical decision making (model based on Higgs *et al*., 2008).

Higgs *et al*., (2008) identified that clinicians' employment of hypothetico-deductive reasoning (HDR: type 2 decision making) or pattern recognition (PR: type 1 decision making) varied. Key influences were familiarity of the presentation and the number of explanations (hypotheses) of cause formulated and discarded by the practitioner prior to identification of a satisfactory explanation.

This is compatible with later models proposed by Crosskerry (2009) and Stanovich (2009). Crosskerry's (2009) "Dual process" theory extended the HDR/PR model and explored the processes through which decisions were made. The pathway of analysis (type 1: intuitive or type 2: analytical) is based on recognition of fundamental aspects of client presentation and processing of features including: context (task complexity, task difficulty, task ambiguity and affective state) and Modular responsivity. Type 2 decisions relate to intellectual ability, education, training, critical thinking, logical competence, rationality and feedback. Type 1 processes may override type 2 depending on circumstances and type 2 override type 1 dependent on surveillance however Crosskerry (2009) suggests that these should be considered as a continuum rather than a dichotomy. Additionally, the model describes a process through which decisions are calibrated (by comparison of the outcome to the decision making stratagems) and a final decision made when accord is reached. This is also compatible with Stanovich (2009) which proposed a reflective model through which decisions are secondary to use of algorithm, analysis and intuition.

Although varying in complexity these models describe interpretation of the signs and symptoms of the client's presentation and determination of diagnosis based on the practitioner's knowledge, skills and experience. Research exploring application of such models to decisions about assessment and treatment by physiotherapists was largely directed at the structure supporting practice. These included acknowledgement of characteristics of the client (and family), the practitioner (and work team) and

the context (organisational, social, cultural, local, global, in which a decision is made (Higgs *et al*., 2008).

Different reasoning processes have been related to level of expertise (diagnostic reasoning based on hypothethico deductive reasoning Vs pattern recognition) or to support different types of decision (procedural reasoning about processes Vs interactive reasoning about patients: Benner, Tanner & Chelsa, 1996). Pivotal work by Edwards *et al*., (2004) based on expert practice suggested that physiotherapists do not employ separate processes for specific purpose but combine reasoning processes in order to address the complexity of clinical practice (those specifically identified were diagnosis, procedure, interaction, collaboration, teaching, predicting and ethical decision making).

1.13.3 Influences on decision making in physiotherapy practice

A wealth of work describes the clinical reasoning strategies which inform decisions made by physiotherapists. Illustrative models include diagnostic reasoning (Edwards, 2004) procedural reasoning (Benner, Tanner & Chelsa, 1996), narrative reasoning (Mattingly, 1991), interactive reasoning (Fleming, 1991) and ethical reasoning (Edwards, 2004).

Greenhalgh (2008) explained that clinical reasoning occurs within the context of interaction between client and therapist and not necessarily to a single event. Higgs *et al*., (2008) suggests that clinical decision making embraces "multiple problem spaces" including the influences of:

- Work team
- Organisation
- Local working place
- Global context
- Social and cultural context
- Family context

This illustrates the complex environment in which practice decisions are made and the number of areas which may be considered.

1.13.3.1 Types of knowledge

Higgs and Titchen (1998) suggested that practitioners employ 3 types of knowledge during collection and analysis of clinical data. "Propositional" academic knowledge of a particular area, "Professional" knowledge or understanding (often tacit or intuitive) which supports practical and technical expertise and "Personal" knowledge acquired through experience (work and non-work) which directs practitioners' values and frame of reference.

Noll, Key & Jensen (2001) explored these with respect to the reasoning employed by an expert (Mackenzie process) practitioner in decisions about the assessment, analysis and treatment of low back pain.

Interview data was transcribed and analysed in order to explore steps in the reasoning process including: hypothesis formation, diagnosis and treatment intervention. Analysis codes were derived from salient clinical reasoning literature: formation of working hypothesis, clinical experience and ability to provide a prognosis (Jones, 1992). In addition to reasoning based on knowledge, cognition and meta-cognition three further influences emerged from transcript analysis; 'elimination' (i.e. excluding a hypothesis related to cause of pain), 'pattern recognition' (symptoms which were interpreted as a group in order to support a working hypothesis) and 'McKenzie method' (when researchers felt that reasoning was specific to that method).

Two reasoning pathways (described as forward and backward reasoning) were identified within a conceptual framework used to form a hypothesis. This was associated with the degree of confidence expressed about pattern recognition within the presentation and related to clinical experiences and post graduate (Mackenzie method) training. Authors concluded that these

two areas formed the core dimensions of the participant's clinical reasoning and organisation of knowledge.

However, this work involved reviewing decisions made by a single musculoskeletal therapist. The authors suggested that similar data should be collected from more therapists including other speciality areas to support greater understanding of clinical reasoning. Future work should explore the influence of named treatment methods and their organization schemata to expedite the formation of clinical reasoning. They conclude that further study is needed to fully understand the impact of clinical experience and specialized training on both clinical reasoning skills and progression towards expertise in physiotherapy.

Edwards *et al*. (2004) described clinical decision making (CDM) in physiotherapy as a process requiring skills of critical thinking and problem solving. This is supported by: speciality specific content knowledge, knowledge of patients (including human behaviour), knowledge of teaching, knowledge of self (reflective ability, confidence, personal and professional growth) and knowledge of context (understanding of their role, the work environment, the health care system).

Such knowledge is derived from mentors, patients, colleagues and friends, professional education, self-education, reading, life events and research in which therapists were actively engaged. Edwards *et al*., (2004) collected data over 12 months from expert practitioners in a range of physiotherapy settings using observation and semi-structured interviews. Thematic analysis of participants' written reflections was employed to examine reasoning strategies within physiotherapy. The initial classification of themes was based on the work of Higgs and Titchen (1998) to determine propositional, professional, and personal knowledge; the results identified complex conceptual frameworks related to reasoning.

The first area of reasoning was of diagnosis and management. Emergent themes suggested that diagnosis was determined through narrative and diagnostic reasoning. However reasoning about management was constructed through awareness of procedure (prescribing and measuring the efficacy of movement and exercise, touch to guide or convey empathy), interactive and collaborative reasoning (communication and problem solving - with the client and other members of the MDT), predictive reasoning in relation to disease process and outcomes, reasoning about teaching (of clients, carers, junior staff/students and other members of the MDT) and awareness of ethical guidelines and constraints.

The second framework suggested that physiotherapists used cues to combine reasoning strategies and the third conceptual framework indicated that there was interplay of the reasoning strategies in different paradigms of knowledge generation, rather than use of different strategies for different tasks. The authors concluded from the depth, detail and diversity of these themes that physiotherapists' reasoning during their clinical practice is complex.

1.13.3.2 Organisation of knowledge

Studies exploring conceptual frameworks established by physiotherapists suggested little consistency in organisation of information to support analysis of assessment findings. Authors concluded that information integration and clinical reasoning strategies are primarily based on personal preference (Edwards *et al*., 2004; Masley *et al*., 2011; Davies & Howell, 2012).

However, seminal work conducted by Edwards *et al*., (2004) suggested that despite variations in structure, reasoning strategies have two purposes. Initially to establish a diagnosis (by identifying limitation through physical disability and impairment and based on understanding the patient's experience and the meaning the patient ascribes to it). Secondly to

determine effective treatment or management (intervention and intended outcome are selected in collaboration with the patient).

Much of the work about knowledge and use of process in clinical decision making has been derived from exploring reasoning strategies of novice and expert practitioners. Results derived from medical research suggest that "expert" practitioners group items and interpret them in relation to previous experience and knowledge via "pattern recognition". Novices use items sequentially to construct a working hypothesis of diagnosis and treatment which is refuted or accepted as the information collected increases (Elstein, Shulma & Sprafka, 1978).

Jones (1992) summarised work investigating reasoning processes employed by novice and expert physiotherapy practitioners in musculoskeletal practice and concluded that Hypothetico-deductive reasoning is employed by clinicians at all levels of practice. Although experts commonly use pattern recognition hypothetico-deductive reasoning strategies are employed in response to atypical presentations.

These findings were supported by further studies. Expert clinicians use logical and organised reasoning, evaluate patient information more holistically than novices, describe examination findings more precisely and accurately and use metacognition and reflection in decision making (Jensen *et al*., 2007). Although experts rely more on tacit and personal experiential knowledge there is less inter-group variance in decision outcome (Case, Harrison & Roskell, 2000). There is some controversy regarding the degree to which expert and novice practitioners use externally generated and group agreed prediction "rules" to guide their decisions (Childs *et al.*, 2004; Stevenson, Lewis & Hay, 2006).

Jones (1992) suggested that individual physiotherapists place different emphasis on the subjective and objective information in assessment and treatment of back pain. Despite this physiotherapy aims are consistent:

identifying source and cause of the presentation, identifying contraindications or precautions during physical examination and treatment, formulating management and prognosis. Jones identified that treatment process is included in ongoing evaluation of hypotheses generated or patterns recognised and adapted a model proposed by Barrows and Tamblyn in relation to medical examination (1980; cited in Jones, 1992) to reflect this cyclical approach.

This model was also supported by the findings of Doody and McAteer (2002) in relation to expert and novice therapists treating orthopaedic outpatients. Ten experienced clinicians and ten students were observed and audiotaped during examination and treatment of a previously unseen patient. The reasoning process used was discussed during semi structured interviews undertaken immediately afterward. All therapists demonstrated HDR, experts also used PR and all participants used treatment to support their reasoning. The authors reported that participants demonstrated a dynamic and cyclical process of reasoning and that their findings were in accord with the model proposed by Higgs (1992).

The applicability of this cyclical model has therefore been related to physiotherapy decisions for clients with low back pain. However Neurological therapists have been shown to use a more holistic approach to assessment and treatment (McClynn & Cott, 2007) and the current study will explore clinical reasoning within this area of practice.

1.13.3.3 Evidence based practice

Over the past 40 years professional bodies, central Government and Department of Health have increased demand for decisions made in and about clinical practice to be based on research evidence (Edwards *et al*., 2004; McGlynn & Cott, 2007; ISWP: RCP, 2012). To this end policies and directives require that registered practitioners provide effective and appropriate health care which meets stipulated standards (Gladstone, 2012;

ISWP: RCP, 2012). Thus in addition to scientific understanding of the structure and function of the human body, health care practitioners must access, assimilate and apply research evidence. These skills are central to undergraduate and post graduate health degree courses (McGlynn & Cott, 2007).

Clinicians report belief that research findings are important, however there is little evidence that these are utilised to support daily clinical decisions (Metcalfe, *et al*., 2001; Bennet *et al*., 2003). Barriers are multi factorial, those most commonly reported include: limited time, limited access to electronic data bases to source papers, limited confidence in ability to interpret research (especially in understanding the results and clinical relevance of statistical tests) and difficulty applying findings to heterogeneous client groups within practice (McGlynn & Cott, 2007).

1.13.3.4 Neurological practice

Analytical and decision-making processes used within clinical practice are based on “clinical data, patient choices and professional judgment and knowledge” (Edwards *et al*., 2004: 313).

Therapists in musculoskeletal practice have been shown to employ a medical model (Doody & McAteer, 2002; Wainwright *et al*., 2011; Davies & Howell, 2012) focussed on body systems rather than social context. In contrast, therapists working in neurology demonstrate consideration of psychological and social factors (Jette, Grover & Keck, 2003; McGlynn & Cott, 2007; Greenhalgh *et al*., 2008; Masley *et al*., 2011).

Research around decisions made in neurological practice has explored discharge planning (Jette, Grover & Keck, 2003) and the selection, use and validation of neurological assessment measures (Greenhalgh *et al*., 2008; Yoward, Doherty & Boyes, 2008; Van Til, 2010). Although there is little work exploring clinical decisions about day to day treatment findings of studies

specifically exploring clinical decision making in neurological physiotherapy practice were consistent with Edwards' *et al*., (2004) regarding complexity of reasoning in clinical practice.

McGlynn and Cott (2007) explored processes supporting clinical decisions in neurological physiotherapy by identifying sources of evidence used by twelve participants with a range of neurological practice experience. Data collected using semi structured face-to-face interviews were analysed using an inductive, iterative coding process to identify concepts. Results suggested daily practice decisions were supported by a variety of sources; categorised by the authors as "informal" and "formal".

Informal sources were implicit, subjective and difficult to quantify; for example, clinical observations, clinical experience, peer consultation and information from clients. Participants especially valued sensory information (collected through touch, vision, hearing and conversation with clients) and used this to support immediate treatment decisions. This included observation of range and quality of movement, identification of movement restrictions, abnormal muscle tone and degree of assistance required to initiate or control movement. "Formal" sources comprised outcome measures, research literature and continuing education courses and were used to communicate and validate work, justify services and standardise practice.

McGlynn and Cott (2007) added to understanding of the paradigm through which physiotherapists interpret information collected during neurological physiotherapy practice. Therapists assigned degrees of importance to information which informed their analysis and subsequent treatment decisions. The authors acknowledged that the small research group may have masked importance of evidence based practice within physiotherapy training. Additionally, participants based rehabilitation on a concept which emphasises use of information collected through observation and touch; this may have skewed the results.

Tyson and DeSouza (2003) showed participants photographs of a “typical” stroke patient in sitting and standing positions (detailed characteristics and pictures were not published in the report). Participants (n=27; 6 focus groups) discussed rationale for assessing posture and balance for that presentation. Assessment suggested evaluating body segment alignment at rest and during movement, identifying specific muscle activation patterns and strength. This underpinned a complex reasoning process to establish what the person was able to do, understand how this was achieved and determine why that strategy was used. Physiotherapists’ conclusion was derived through developing understanding of the interrelationship between the observed impairment and the balance disability.

Findings of Tyson and DeSouza (2003) and McGlynn and Cott (2007) supported previous studies (Sweetland & Craik, 2001; Rappolt & Tassone, 2002) and indicated that despite external pressure to use formal sources therapists base day to day practice decisions on informal sources of evidence. Information considered most valuable was from clinical observation, relevant clinical experience, peer consultation and information from clients. Objective quantifiable sources of evidence (outcome measures, research literature) were used to a lesser extent in making practice decisions. This information was used to identify clinical problems, determine patients’ potential and evaluate the effect of selected treatment options.

The findings of studies specific to neurological physiotherapy (Tyson and DeSouza, 2003; McGlynn and Cott, 2007) were used to inform the questions for phase 2 and 3 of the current study.

1.13.4 Client centred practice

Changing socio-political perspective defines practice context (Barr & Threkeld, 2000; Edwards *et al*, 2004). Community based health care delivery has extended over the last 20 years to support an aging population (Edwards *et al*., 2004). Relocation of services altered dynamics between health care

providers and service users and change emerged from acknowledgement of individuals' right to participate in decision making affecting their health (World Health Organisation, 1978; Sim, 1998).

These changes are reflected in Government Policy (Department of Health, 2012), guidelines related to 'Best Practice' (Department of Health, 2001; ISWP: RCP, 2012; NICE, 2013) and directives regarding Professional responsibility and behaviour (CSP, 2011; Health and Care Professions Council, 2013). Use of the use of the World Health Organisation model: International Classification of Function which emphasizes the physical, personal and social aspects of patients' conditions is widespread (Barr & Threkeld, 2000).

Physiotherapy education and practice acknowledges that individuals ascribe personal meaning to the pathological process that they experience. Clinical decisions made by physiotherapy practitioners are complex and context specific (McGlynn & Cott, 2007, Health and Care Professions Council, 2013). In order to identify clinical problems and develop effective strategies it is valuable for physiotherapists to understand the scope and epistemological basis of their professional practice and the way that it relates to that of other health care professions (Gladstone, 2012).

Client centred practice is supported by the Integrated Client Centred model of reasoning (Higgs *et al*., 2008), key features include:

- Use of cognition or reflective enquiry
- Discipline specific knowledge
- Metacognition
- Mutual decision making involving the patient and /or carer
- Contextual interaction
- Task impact

Thus physiotherapy practice includes integration between practitioner capabilities, evidence based practice, patient perspective and context.

Clinical decisions are based on propositional & non-propositional discipline specific knowledge. Cognition and reflective inquiry are used to support analysis, synthesis & evaluation based around multiple perspectives. Finally, metacognition through reflective self-awareness is used to monitor the effectiveness of reasoning about practice. However, research suggests that translation of these client centred objectives into practice decisions is varied.

Information derived from the interaction between the client and the therapist may influence expert practitioners' decisions regarding content and delivery of physiotherapy interventions across a range of practice areas. Experts placed greater value on patient's achievement of everyday tasks and collaborated with patients in making decisions about interventions (Jensen, Gwyer & Shephard, 2000; Schreiber & Stern, 2005; Jensen *et al.*, 2007; Davies & Howell, 2012).

Findings from studies about discharge planning further demonstrated that physiotherapists considered individual patient attributes when making decisions. Jette, Grover and Keck (2003) interviewed seven physical therapists and three occupational therapists about decisions related to discharge from an acute care setting. Although results cannot be directly translated into neurology four constructs influenced therapists' decisions: patient functioning and disability, patients' wants and needs, patients' ability to participate in care and patients' life context. Authors concluded that discharge suggestions reflected therapists' consideration of patients as individuals and regard for the environments in which they live although final decisions were tempered by Health Care Regulations and the opinions of other health care professionals.

Pashley *et al*., (2010) interviewed three physical therapists and conducted a focus group with a further seven about decisions about discharge from orthopaedic outpatient physiotherapy. Findings supported and extended previous work by identifying experienced therapists approach to client

centred care recognised the patient's role in rehabilitation and promoting goals related to self-management.

However, these studies were undertaken from the therapists' perspective, findings from research regarding shared decisions and empowerment between client and therapist are inconclusive. Clients expressed desire to act in partnership with therapists (Slade *et al*., 2009), reach agreement over decisions on treatment plans or modalities (Melander & Fältholm, 2006) or be empowered to self-manage their condition (back pain; May, 2007).

Clients' expressed concerns regarding the paucity of information shared with them and perceived that treatment plans were influenced by clinicians preferred options (Pellatt, 2004; Melander & Fältholm, 2006; Jones *et al*., 2008; Slade *et al*., 2009). Research suggests that clients' value information about their rehabilitation, rationale for treatment, progress and recovery (Jones *et al*., 2008; Slade *et al*., 2009) and want therapists to deliver accurate and comprehensible explanations, listen attentively and treat their suggestions and opinions seriously (Melander & Fältholm, 2006; Slade *et al*., 2009).

In contrast therapists perceive that patients adopt a passive approach secondary to lack of expertise in rehabilitation or recognition of prognosis (Ayana *et al.*, 1998; Young *et al*., 2008). Studies exploring client participation in goal setting (Hale *et al*., 2003; Conneeley, 2004; Melander & Fältholm, 2006) and establishing content of treatment sessions (Wottrich *et al*., 2004) suggested that patient/therapist partnership during rehabilitation can be limited by clients' perception of therapists as experts (Wottrich *et al*., 2004; Slade *et al*., 2009).

Wain, Kneebone & Billings (2008) explored patient experience of in-patient neurological rehabilitation for a small client group (n=8) using interpretative phenomenological analysis of semi-structured interviews. Data analysis suggested that the overarching theme which they termed 'person

centeredness' comprised four key areas; ownership, personal value, holistic approach, and therapeutic atmosphere. These were based on patients' perceptions of choice, control and feelings of personal respect and self-worth. Clients valued: understanding staff, achieving physical improvements, psychological gains and an informal, relaxed environment.

Proot *et al*., (2007) explored client perception of autonomy following stroke (n=22). The study was conducted in the Netherlands; findings are not directly transferable to UK healthcare structure but participating clients experienced rehabilitation in a residential environment where the objective was to return to living at home which matches UK healthcare goals.

Data were collected on admission, during rehabilitation and at discharge and explored constraints and professional approaches to client autonomy through semi structured interviews. Results generated using a grounded theory approach identified that on admission clients considered they had little autonomy and independence but valued this 'paternalistic' approach by health care professionals in early stages of rehabilitation. Further, clients' perceived that professional expertise and experience increased their physical recovery by supporting them to successfully attempt tasks they did not feel they could complete.

However, clients' also reported that paternalistic care extended longer than was therapeutically required and identified desire for more opportunity to relate functional recovery to achieving independence. Participants requested more discussion regarding therapist rationale for inclusion/ exclusion of tasks and consultation over other decisions (for example timing of sessions). Clients' perceived that limited opportunities to control aspects of their life limited preparation for independent decision making after discharge.
Thus key studies (Proot *et al*., 2007; Wain, Kneebone & Billings, 2008; Schoeb & Bürge, 2011), suggest that patients' desired level of autonomy should be supported. Timing for ceding independence is individual to each patient but should increase during an episode of care in preparation for

discharge. Clients' suggest this encompasses non-treatment aspects of care in early stages of rehabilitation (for example waking-up time, and how to spend the day) and progress to shared decision making about treatment (for example, concerning which activities should be learned and to what extent) and discharge planning (necessary aids). Increased client autonomy could be achieved through greater provision of information (including progress evaluation) and discussion about treatment plans and discharge decisions.

1.13.5 Client/therapist collaboration

Client centred practice is based on collaboration between practitioners and patients to understand a 'problem' within the context of the patient's life, negotiate goals and plan therapy interventions (Barr & Threkeld, 2000, Edwards *et al*., 2004). This approach is supported by studies which demonstrated that collaborative practice improves clinical outcomes (Neistadt, 1995; Piggot, Paterson & Hocking, 2002).

Research relates client-centred approach to expert practice but acknowledges that it is challenging to achieve (Edwards, 2004b). Barr & Threkeld (2000) identified four key components which form the basis of collaborative practice:

- Establishing the therapeutic relationship.
- Diagnosing through mutual enquiry.
- Finding common ground through negotiation.
- Intervening and following up.

Key aspects were interaction (verbal and non-verbal) to facilitate discussion regarding client's goals and beliefs about their disability (Jensen & Lorish, 1994), discussion of possible interventions, forming a relationship based on shared responsibility for the outcome (Jensen *et al*., 1997) and affirmation of the patient's role in recovery (Martin, Siosteen & Shephard, 1998).

Despite declared support for collaborative practice implementation was limited (Edwards *et al*., 2004). Areas contributing to difficulties included: perceived reduction in professional (Haswell & Gilmour 1997; Thornquist, 2001a and b) and hands-on therapeutic "skills" (Litchfield & MacDougall, 2002, Edwards *et al*., 2004), desire to implement interventions supported by research evidence rather than those based on clients' requirements and suggestions (Silagy, 1998: cited in Edwards *et al.*, 2004) and lack of the specialist level of communication needed to support collaboration (Payton, Nelson & Hobbs 1998; Litchfield & MacDougall, 2002).

Collaboration may be influenced by the patient's particular health problems, prior experiences, culture and ethnicity, socio-economic status and educational levels. Thompson (2007) found patients' preferences about medical treatment varied with illness type (acute or chronic), seriousness of condition (degree of expert knowledge required), personal characteristics (knowledge, experience and personality) and patient–professional interaction (confidence to allow others to act on their behalf); there is no comparable research for physiotherapy (Schoeb & Bürge, 2011).

Complexity in sharing decision making results from the need for collaboration between individuals with different domains and levels of knowledge, different perspectives and different implications from involvement. Therefore, collaborative decision making may take different forms depended on circumstances (Edwards *et al*., 2004).

Several models of collaboration were suggested by Edwards *et al*., (2004). In the first the practitioner uses specialist knowledge to inform or deliver the intervention. The client does not share this knowledge but collaborates through active participation. The therapist directs the intervention based on therapy knowledge but the client shares the overarching objective (for example increase in range of movement, or achievement of a functional task) and retains the right to withdraw collaboration by ceasing the movement. Sim (1998: 8) endorsed that this represented collaboration on the premise that

client autonomy includes the right to intentionally and temporarily relinquish this as long as ‘‘this does not irrevocably foreclose one’s future self-determination’’.

In the second type of collaboration aspects of the content or delivery of an intervention are changed in response to information or feedback from the client. The client approves the principle or objective of the intervention and delivery is modified following client/therapist discussion. Thus practice is decided by the client and followed by the practitioner, the agreed intervention is that which is “most acceptable” to the client not that which is considered “most effective” by the therapist. This model is based on understanding of the personal and variable nature of a client’s experience of physical impairment and therapy interventions and is considered to support much of clinical practice (Mattingly, 1991; Jensen *et al*., 1999).

In the final example knowledge is transferred between client and practitioner. For example, the practitioner recognises that their expertise is not the dominant factor in the decision-making process and alters perspective through working with a client who has a different conception of their abilities or health care needs. Equally a client may not have previously considered achieving function or participation through methods other than standard body structure or movement.

Edwards *et al*., (2004) emphasised the value of all forms of collaboration and suggested that each reflected knowledge and skill production important for physiotherapy. Firstly, the pre-eminence of practitioners’ knowledge, which reflects a preferred or recommended treatment and which is predominantly understood and mediated in an empirico-analytical manner. Secondly, the mutual ‘‘construction of meaning’’, which places a high value on patients’ insights and interpretation of their problem(s) and their subsequent responses. This knowledge is derived and understood within an interpretive framework. Finally, the alteration of therapist and patient perspectives

through reflection on underpinning beliefs; this may lead to new knowledge and refute limited or distorted viewpoints.

1.13.6 Client/therapist interaction

Rehabilitation is an active, educational, problem-solving process focused on the functional needs of the client (Rosewilliam, 2011) and client centred care has been recommended as part of practice since the 1980's (Roberts, 2002; Thompson, 2007, Schoeb & Bürge, 2011). A wide body of work suggests that involvement of clients in making decisions about their care impacts positively on satisfaction, participation and achievement of function (Sluijs *et al.*, 1993) but research identifies that both therapists and clients find this challenging (Proot *et al*., 2007; Rosewilliam, 2011; Schoeb & Bürge, 2011).

Difficulties include socio-political aspects related to model of care and discrepancy in level of theoretical and experiential knowledge (Proot *et al.*, 2007), patients' perception about their ability to engage with the process (Levinson *et al*., 2005; Holliday, Ballinger & Playford, 2007; Wade, 2009) and clinicians concerns about effect of pathology on cognition and communication (Proot *et al*., 2007). Clients may hesitate to participate in the decision-making process and cede responsibility to 'experts' (Conneeley, 2004; Wottrich *et al*., 2004); clinicians may not actively engage patients in setting goals (Baker, *et al*., 2000; Parry, 2004; Suddick & DeSouza, 2006).

Treatment sessions were observed by Wottrich (2008) and activities and discussions between therapist and patient were noted. Post treatment interviews were recorded separately with therapists and clients, discussion included observations about how decisions were made and goals were set during the treatment session and features indicating the perceived quality of the session were identified. Six themes were identified: setting and attaining goals, focusing on motor activity, finding the optimal training strategy, facilitating active patient involvement, making use of environmental factors and adjusting to the structural reorganization of rehabilitation services.

Important findings were differences in perspective of therapists and patients. Physiotherapists expressed that they lacked scientific knowledge; in contrast patients trusted physiotherapists' competence. Physiotherapists reported that they considered the patients' personal experiences during treatment; this was not apparent to the patients.

Thus, although shared decision making is one of the keystones of client centred care and is supported by UK Government (DoH, 2011), and International Physiotherapy guidelines (APTA, 2001; CSP: 2002; WCPT, 2002; Schoeb & Bürge, 2011) there is evidence that clients are not empowered to engage in the decision making process to the extent they wish (Gattellari *et al*., 2001; Ford *et al*., 2003; Ford *et al*., 2006; Hubbard *et al*., 2008).

Jones, Mandy and Partridge (2000) suggested that lack of parity may result from treatment paradigms which emphasised 'passive' handling techniques and compounded by therapists' belief that function should only be conducted within the clients' level of balance and motor control (Davidson & Waters, 2000). Although this may be a factor, more recent understanding of task related strengthening as a component of rehabilitation after neurological damage would be expected to impact on this and recent studies (Schoeb & Bürge, 2011) suggest that this is not the case.

Although the literature on medicine and health care professions provides some insights into this topic, specific aspects in the field of physiotherapy are less well explored (Schoeb & Bürge, 2011). Additionally, much of the work has been done with regard to 'goal setting' and few studies have explored therapist /client interaction during therapy. The findings of two such studies are especially relevant to the current study.

Communication during treatment following stroke was explored by Parry (2005). Treatment sessions (74 sessions between 10 senior therapists and 21 stroke clients) were video recorded and the content of the communication

analysed. Results identified that therapists described successful performance to clients in terms of specific movement criteria but frequently avoided doing this in relation to less successful movements. Data demonstrated that therapists used language strategies which softened the message, for example by acknowledging the difficulty of a movement prior to the patient's attempt. Therapists also avoided giving verbal feedback by adjusting the patient's position rather than engaging in discussion. Parry (2005) suggested this may reflect therapists' tension between therapeutic necessity, professional responsibility to identify, inform and correct movement problems and demonstrating courtesy, consideration and respect for another person. However, the result from the patients' perspective may be ambiguity and lack of clarity which further limits correct performance.

These findings were endorsed by Durham *et al.*, (2008). Interaction during treatment sessions (8 therapist/client pairs) for the upper limb were recorded and analysed and interviews were conducted with participant therapists. Findings suggested that only 10% of the statements made by therapists to clients were feedback, the rest comprised instructions and statements of motivation. Additionally, the feedback directed the patient's attention to type of body movement rather than effect of movement. This suggests lack of consistency in a key aspect of treatment which may be based on therapists' perception of role and responsibility rather than on client need for accurate and impartial information. This may impact on treatment efficacy.

McGlinchey & Davenport, (2014) explored therapists' decision making regarding treatment on a UK based rehabilitation/stroke unit. The study included seven therapists and four patients and data were collected through observation and thematic analysis of interviews with therapists. Three interconnected themes emerged; planning the ideal physiotherapy delivery, the reality of physiotherapy delivery and client involvement in the decision-making process. Findings indicated that therapists based clinical reasoning on numerous factors and employed several strategies in order to plan and deliver physiotherapy. These included the therapist's clinical experience,

patient's presentation and response to therapy, organisational constraints, need for prioritisation and compliance with organisational practice.

Interestingly therapists perceived that patients were very involved in decision making but observational data suggested this varied. Patients reported that they were involved in goal planning, organising treatment at a specific time of day and that therapists attempted to provide as much treatment as possible, but expressed concern that the length or frequency of the treatment was often affected by staff availability.

These findings suggest that there is discrepancy between therapist and client perceptions of collaboration with respect to treatment. Phase 3 of this study aims to explore this in relation to an identified physiotherapy session.

1.13.7 Psycho social aspects of clinical decision making

A small number of recent publications introduced and explored potential effect of clinicians' philosophical stance with regard to the meaning of "the body" on clinical decision making. Thornquist (2001b) and Nicholls and Gibson (2010) argued that the medical model developed from the (Cartesian) premise that the mind and the body were separate from one another. The perspective of the body as a vessel/container implied that "symptoms" could be observed and interpreted by clinicians from a neutral perspective with increased clarification derived from results of specific medical tests. Thus the experience of the patient was reduced to the practitioner's interpretation of separate observations.

Social change during the 1960's provided insight into mind/body interaction based on awareness of the body as a means of interpreting social experiences, expressing feelings and individuality (Nicholls & Gibson, 2010; Thornquist, 2001b).

Thornquist (2001b) explored physiotherapy diagnostic process and the assumptions, classificatory systems and explanatory models underlying it. This study was undertaken in Norway, however two areas discussed are similar to UK practice and the findings are informative and provide further context to the observations of McGlynn and Cott (2007) and Jull and Moore (2009) of different interpretation within different areas of physiotherapy practice.

Physiotherapy assessment was observed in manual, psychomotor and "visiting" services (descriptions of manual and "visiting" categories are similar to musculoskeletal and community therapists in UK practice and this discussion will focus on those; psychomotor therapy is not transferrable to UK practice). The "visiting" category is especially relevant because the client group included stroke. Interactions were video recorded and supplemented by participant interviews. Thematic analysis of interviews from different practice areas suggested different approaches and interpretive frameworks were employed.

Assessment emphasised different aspects of presentation and interpretation varied. Manual therapists employed a diagnostic model; examination was based on biomechanical perspective to identify areas of limited movement secondary to joint mobility, altered reflexes and sensation. Analysis explored relationships between body segments in order to make a diagnosis and treatment aimed at achieving improved balance between joints and segments of mobility. In contrast "visiting" therapists considered the direct and indirect consequences of disease (including stroke) and examined active movement, function, independence and life style. Interpretation aimed at understanding efficacy of movement and determining functional capability rather than quality of function i.e. to establish the person's capacity in relation to the demands of their environment. Treatment objective was to improve capability of executing safe and functional movement within a certain environment and the patient's own views about this were considered.

From a philosophical perspective Thornquist (2001b) suggested that manual therapists employed understanding of normality and pathology and based practice decisions on belief about how that person should achieve function. However, “visiting” therapists’ emphasised achievement of function with minimal assistance. Differing philosophical stances were demonstrated throughout the interaction between therapist and client. Manual therapists asked specific questions based on professional knowledge and the client responded; visiting therapists sought the view of the patients and both parties used discussion and questions.

Thornquist (2001b) concluded that practice and conceptual analysis differs among physiotherapists; this is in accord with later but less detailed work by McGlynn & Cott, (2007) and Jull and Moore (2009). Thornquist (2001b) identified that future work should reflect actual practice and support examination of the diagnostic process as an active, interpretative exercise between therapist and client. This is supported by the recent work of Nicholls & Gibson (2010).

Nicholls & Gibson (2010) describes the development of physiotherapy professional status. Adoption of a biomechanical paradigm established credibility but the authors suggest this limits further development of the profession within the modern social and political context. Nicholls & Gibson (2010) referred primarily to musculoskeletal practice but propose a practice perspective based on “embodiment” which was defined as “orientation towards the whole person” (p. 503). This includes awareness of the objective reality of a person’s illness (anatomy, physiology, pathology), but also understanding of the subjective meaning given to the persons lived experiences of health and disease and consideration for social institutions (political, social, structural) that mediate people’s bodily experiences and behaviours.

Although to some extent this describes a bio-psycho-social perspective which is familiar within neurological practice the linking of these aspects to describe the entire “person” overtly acknowledges the inclusion of these

factors within the entirety of the persons ‘being’ rather than as external constructs.

1.14. Summary

1.14.1 Defining clinical practice

Although all areas of Physiotherapy clinical practice are considered to be poorly defined research suggests that definition within neurological practice is especially poorly articulated; to the extent that it has been described as a ‘black box’ (Bode *et al*, 2004; Dejong *et al*., 2004).

Government strategy for the National Health Service is strongly influenced by social and political changes and regulation has moved from individual professional bodies to external agencies which are overseen by Government. Professional accountability is mandatory from a legal perspective (Health and Care Professions Council, 2015).

There are financial as well as moral, ethical and professional imperatives which require that physiotherapists are able to provide greater specificity about content of practice and identification of practice limitations (Sentinel Stroke National Audit Programme: Royal College of Physicians, 2015). The profession needs to be able to demonstrate that interventions are not just effective but that they provide best “value for money” (Any Qualified Provider, Department of Health, 2011; Clinical Commissioning Groups from March 2014).

Government policy supports the need for health care providers to collaborate with service users in order to prescribe and deliver interventions which meet the physical, emotional and social needs of the individual (Department of Health, 2012). Thus physiotherapists are increasingly asked to explain their treatment suggestions and mode of delivery and to identify and discuss other options.

This requires that the profession addresses the lack of specificity and detail about practice content and identifies salient features supporting decision making to explain why a specific intervention has been suggested. Work has started on this; recent research detailed the process of recording the content of physiotherapeutic interactions (Donaldson, Tallis & Pomeroy, 2009). Tyson & DeSouza (2003), McGlynn & Cott (2007) and McGinnis *et al*. (2009) published “Models of practice” which explore processes through which physiotherapists use information derived from numerous sources in order to support their decisions.

Researchers involved have suggested that future work should expand the understanding of this area and explore how relevant the models are to practice in other areas. Thus, the aim of phase 1 of this study is to support existing research regarding the context within which physiotherapists make decisions about interventions for the rehabilitation of the hemiplegic upper limb following stroke.

Phase 2 of this study will contribute further to this emerging evidence base by exploring aspects of the examination and interpretation of data considered important by physiotherapists in order to treat dysfunctional upper limb movement resultant from stroke.

Phase 3 will develop this area of knowledge further by exploring influences on decision making during delivery of physiotherapy to address upper limb movement problems following stroke. This will be explored from the perspective of the client and the physiotherapist.

1.14.2 Influences on the clinical reasoning of physiotherapists

The keystones influencing clinical reasoning within physiotherapy practice are Propositional, Personal craft and Professional knowledge (Higgs & Jones, 1995). Neurological physiotherapy is delivered within a paradigm of bio-psycho-social reasoning (Doody & McAteer, 2002; McGlynn & Cott,

2007) and in collaboration with the patient, family and other health-care professionals to provide “person centred care” (Jensen *et al.*, 2000; Steiner *et al*., 2002; Resnick & Jensen, 2003). Therapists working in neurology demonstrate consideration of body systems within a psychological and social context (Jette, Grover & Keck, 2003; McGlynn & Cott, 2007; Greenhalgh *et al*., 2008; Masley *et al.*, 2011).

Facets of reasoning indicate development as a physiotherapy practitioner; chief amongst these are the use of metacognition and reflection (Jensen, Gwyer & Shephard, 2000; Edwards *et al*., 2004). Thus, hypothetico deductive reasoning which is commonly associated with novice practitioners is refined through repeated exposure to common clinical presentations to create templates of “grouped information” which are used to establish clinical relevance.

However, Davies and Howell (2012) considered the diagnostic aspect of physiotherapy decision making and demonstrated variation in the way that physiotherapists approach the task of collecting, organising and interpreting clinically relevant information. The authors identified that at present there is no evidence predicting how therapists approach this analysis and no support for the accuracy or efficacy of any specific approach.

Decisions are informed by pattern recognition (Noll, Key & Jensen, 2001; Norman, 2005; Higgs *et al*., 2008; May *et al*., 2008) and forward reasoning (Patel & Groen, 1991; Edwards *et al.*, 2004) which may lead to the development of personal or professional heuristics (Cioffi, 2012). Despite increased understanding of this aspect of decision making work to explore features which therapists working in neurology recognise and consider important is sparse. Phase 2 of this study aims to address this by exploring these influences on decision making in greater depth.

Finally, interaction between the client and the therapist has been explored in relation to goal setting (Baker *et al*, 2001; Arnetz *et al*., 2004; Rosewilliam *et*

al., 2011) and client experience (Wottrich *et al*, 2004; Proot *et al*., 2007; Wain, Kneebone & Billings, 2008; Kidd, Bond & Bell, 2011; Schoeb & Burge, 2011). However little work has explored the contribution of client and therapist collaboration to decisions made during treatment (Barr & Threkeld, 2000; McCain, 2005); phase 3 of this study aims to explore this aspect of decision making and contribute to the evidence base supporting understanding in this area.

1.14.3 Areas to be addressed

Recovery of upper limb function following stroke is poorer than that of the lower limb and this impacts on independence and quality of life. Physiotherapy is a key component of rehabilitation and it is therefore important that practice is effective. Additionally, there is increasing pressure from Government and Professional bodies that Health Care Practice is supported by evidence which has been tested through research studies.

Physiotherapy practice in neurology is dominated by two paradigms, the Bobath concept and the Motor Relearning Process. Existing work has concentrated on comparing the efficacy of these paradigms and establishing the effect of isolated interventions. This is of limited value as clinical practice includes many variables which cannot be reproduced in research trials. Additionally, therapists analyse information about the response to an intervention as part of their reasoning process, which adds further disparity.

Thus there is variability between clients and physiotherapists and decisions related to treatment of the arm are complex. It is therefore hard for therapists to determine the applicability and efficacy of research findings to aspects of practice.

The original definition of Evidence Based Practice included the perspective of expert practitioners but there is little work exploring this for treatment of the hemiplegic upper limb after stroke.

Thus this study aims to address those areas and expand knowledge of decisions made by physiotherapists in this area by identifying:

- Demographic characteristics of therapists and clients and environmental factors which may influence treatment decisions Exploring the approach to and content of assessment and treatment of the hemiplegic upper limb
- Exploring features considered important to therapists and clients within delivery of an intervention for the hemiplegic upper limb.

CHAPTER 2: Methodology.

2. Methodology

Methodology is underpinned by philosophical and theoretical ideas; data collection and analysis methods emerge from methodologies (Finlay & Ballinger, 2006).

2.1 Research paradigm

This study was based on paradigms of Pragmatism and Practice relevance.

2.2 Overarching methodology

This was a mixed methods explorative study including quantitative and qualitative data. It explored the way that Chartered physiotherapists used information collected during interaction with a client to inform and support decisions made in practice regarding the content, design and delivery of a therapeutic intervention addressing movement problems of the hemiplegic upper limb after stroke. Context was initially obtained through quantitative method and qualitative data were used to provide deeper perspective.

2.3 Characteristics of qualitative and quantitative research methods

Historically research methodologies are based on one of two paradigms: positivism (more recently attenuated as post-positivism) and constructivism. Quantitative research methods are generally supported by positivist paradigm and qualitative methods by a relative/constructivist paradigm (Robson, 2002; Cresswell, 2009; Ritchie & Lewis, 2013). The assumptions and features of these constructs are summarised below (see Table 2.1).

Assumptions of positivism	**Features of relativism/constructivism**
Objective knowledge can only be gained from direct experience or observation	Scientific accounts and theories are not privileged, different approaches are alternative ways of looking at the world and should be described rather than accorded truth value
Science permits the identification of facts	There are a number of criteria which influence the choice of theoretical framework or explanation
Science is based primarily on quantitative data, derived from the use of strict rules and procedures	Reality is represented through the eyes of the participants, there is no external reality independent of theoretical beliefs or concepts
All scientific knowledge is founded on facts. Hypothesis are tested against these facts	Emphasis on the role of language as a central instrument through which the world is represented and constructed
The purpose of science is to develop universal causal laws	And experience or behaviour should be viewed in context and complexity is acknowledged
Events can be explained through their relation to a causal law	The research process generates working hypothesises rather than empirical facts
It is possible to transfer the assumptions and methods of natural a science to social science	Theory is based on the premise than Concepts emerged from data

Table 2.1 Assumptions and features of positivism and constructivism (Robson, 2002; Cresswell, 2009; Ritchie & Lewis, 2013).

Positivism is based on the premise that causal relationships exist and can be identified through manipulating one (independent) variable and assessing the effect on another (dependent) variable. Key to this paradigm is the

consideration that the researcher is detached from the process and acts as an independent observer to objectively record data obtained. Quantitative research methods comprise scientific approach through experiments and surveys (including structured questionnaires); data collected is numerical and can be statistically analysed.

Robson (2002) suggests that this approach requires a reasonably formulated understanding of the phenomenon under investigation. Data are collected prior to analysis in order to support or refute an already constructed hypothesis. The outcome of the enquiry will either tend to confirm the theory or indicate the need for its modification which can then be reformulated and retested.

In contrast qualitative research theories and concepts arise from enquiry and result from data collection rather than preceding it; the process is hypothesis generating rather than hypothesis testing (Robson, 2002: 19). Interpretivism stresses the importance of interpretation in addition to observation in understanding the social world. A related concept Constructivism is based on the premise that reality is (socially) constructed and the role of the researcher is to examine, interpret and understand the underpinning meaning and knowledge. The researcher is considered be integral to the construct which cannot be externally or impartially observed and objectively recorded. Indeed, part of the process of ensuring the academic rigour of data is “reflexivity” through which the researcher acknowledges and reflects on their own effect within the research process. Initial theory formulation is elaborated and checked during an intertwined interpretive process of collection and analysis; the researcher is considered to be part of the process not an impartial observer (Robson, 2002; Ritchie *et al*., 2013).

Physiotherapy practice is based on underpinning commonalities and “techniques” but these are delivered at client specific level. Practice questions may be best informed by considering both quantitative (empirical,

deductive) and qualitative (inductive) assessment (Robson, 2002; Cresswell, 2009).

2.4 Factors influencing the research methods selected

Review of existing literature (within stroke rehabilitation) suggested that therapists were influenced by propositional and experiential knowledge and structural issues related to service delivery and client group (Fleming, 1991; Mattingly, 1991; Benner, Tanner & Chelsa, 1996; Edwards, 2004). Work exploring and documenting the content of physiotherapy interventions suggested coherence in treatment objectives (Lennon, 2003; Tyson & Selley, 2006; Natarajan *et al*., 2008) but less certainty about core physiotherapy content and very little information about treatment implementation (Nilsson & Nordholm 1992; Carr *et al*., 1994; Turner & La Trobe, 1997; McGlynn & Cott, 2007; Albert & Kesselring, 2012).

Physiotherapy after stroke has been considered historically to be informed by two paradigms. Both are supported by research about motor control, enhancing recovery of movement and function through neuroplasticity (and compensatory adaptation if necessary) and principles of motor learning (Raine, Meadows & Lynch-Ellerington, 2009; Carr & Shepherd, 2010). Thus core content is similar although delivery may differ. Further, extant literature suggests that therapists use aspects of both paradigms to inform practice decisions.

Interventions recommended by professional guidelines and Cochrane reviews form a succinct subgroup to address specific movement problems and may not represent the majority of the delivery. Additionally, although literature acknowledges barriers and difficulties to achieving this physiotherapy is undertaken in association with the client and based on mutual engagement and collaboration. Participation and interaction are integral to decisions about therapy delivery and the perspective of the client is as important to understanding clinical decisions as the perspective of the

therapist. Thus it was imperative that the study included the perspective of both clients and physiotherapists.

Therefore, the methods selected needed to be able to:

- Provide contextual basis for the exploration of practice decisions
- Provide means of exploring decisions about physiotherapy interventions from the perspective of the therapist
- Provide means of exploring the experience of the client during the delivery of therapy

It was apparent that this involved some finite characteristics related to physiotherapists and the scope and structure of their practice. These data could be documented and relationships between them investigated using quantitative methodology. A decision was made to use a survey because this permitted access to information collected from a large number of people over short period of time; although this involved the use of questions with a limited number of responses this could be widened by including options for "other" in order to collect data about less common aspects.

It was also important to collect contextual information regarding participants' opinions and this suggested the need for a different approach. Qualitative data were collected by inclusion within the survey of open questions to explore participants' thoughts and opinions about specific factors.

However, the overarching research objectives require acknowledgement of complexity. Participating physiotherapists and clients are part of heterogeneous groups; the number of combinations of physiotherapist and client characteristics, even within the limitation of "rehabilitation after stroke" is innumerable. These physical, cultural and social aspects influence clinical decisions in ways which are unique and unpredictable and the study therefore required a means of exploring these factors in order to represent the "richness" of the arena within which clinical practice decisions are made and to allow exploration of a range of responses. Thus data about lived

experiences and beliefs were required and this could be met by qualitative methods; thematic analysis of data collected through semi-structured interviews.
Physiotherapy is an interactive process and this suggested the importance of considering this from the perspective of the client; it was anticipated that greater depth could be achieved if data were collected with regard to a personal experience of therapeutic interaction. For this reason, a semi-structured interview/ guided reflection through viewing a video recording of a specific treatment session was utilised.

The research objective was the exploration of the selection, delivering and receiving of physiotherapy intervention for the hemiplegic upper limb after stroke. This was divided into three parts: the primary objective of the first phase was to identify physiotherapists' opinions regarding features affecting movement of the upper limb after stroke, the treatments from which they might select and to explore aspects affecting that selection. A further objective was to provide context for the data by detailing participants' background with regard to their knowledge, experience and the structure of the service.

This was addressed using a semi structured questionnaire; closed questions collected information which could be reduced to numerical data in order to explore the possibility of relationships between data sets. Open questions allowed expansion and initiated the exploration of the therapist's view of the world in which they practiced and the way in which their experience of this world influenced or guided their decisions.

The second part of the study explored influences on the decisions made in clinical practice in greater depth. This phase was sequential to phase 1 and the area of discussion was partially informed by the findings of the open questions within the questionnaire. The aim of this phase was to allow therapists to use narrative to describe their experiences and the areas which they considered important during the treatment of the hemiplegic upper limb

after stroke. This focused on discussion about the content of their initial assessment and treatment and the reasons why they had included these areas.

The final phase of the study explored the way that decisions about treatment evolved during therapeutic intervention. Physiotherapy is an interactive process and it was important that the opinions and perspective of both clients and physiotherapists were included. The broader opinions of physiotherapists on both a propositional and experiential level were explored during phase 2; comparable views of clients had not been recorded because of time and ethical constraints. The objective of phase 3 focussed on the decision making aspect of the “shared” experience; thus it was desirable that the study considered the same experience from the two perspectives. For this reason, a treatment interaction was recorded and opinions about the treatment decisions made during this event were sought from the participants; client and physiotherapist.

2.5 Survey based studies

Robson (2002:48) suggested that the term survey commonly refers to the collection of standardised information from a specific population, or some sample of one, usually by means of a questionnaire or interview. Survey data can be used to describe characteristics, explore aspects of a situation, or to seek explanation and produce data for testing hypotheses (Calnan, 2007). Survey methods are useful to compare variations between groups within large populations although they do not easily capture meaning and perceptions under specific contexts. Data analysis is based on coding frameworks, and researchers (Calnan, 2007; Cresswell, 2009) identified five types of objectives; identification of characteristics of respondents, description of responses to specific questions, determination of correlational relationships, determination of differences and statistical relationships between sub groups. However, they caution that there is frequently variation in response to specific questions which may limit analysis.

2.6 Interview based studies

Interviews are considered core to qualitative research methods and generate descriptive information regarding the interviewees' perspective of the area of interest (Richie *et al.*, 2013). Interviews are based on specific objectives (Silverman, 2010; Berg & Lune, 2012; Rubin & Rubin, 2012) although there is academic debate reading the philosophical stance. Interviews might provide access to participants' pre-existing views and knowledge (post-positivism: Brinkman, 2009) or interviewer and participant may share and create knowledge during the process (constructivist: Gubrium & Holstein, 2011). Researchers acknowledge that this may cause concern about applicability of findings but suggest that although knowledge is generated within a specific interaction it is meaningful beyond the immediate context (Miller & Glassner, 2011; Ritchie *et al*., 2013).

These perspectives form the basis of critique of interviews as devices for data collection. Ritchie *et al*., (2013) suggest researchers take care in interpreting findings. Interviews conducted and interpreted within a positivist paradigm are structured but there is risk of viewing the data as authentic and accurate without considering context and interaction. Conversely in depth exploratory interviewers are at risk of interpreting data as representing fully authentic description of participant's life (emotionalism) or as only true within the reality of the interview (constructivism).

2.7 The emerging paradigm

The study intention was to seek the opinions and experiences of therapists and clients; this allowed the subject area "physiotherapy decisions about treatment of the hemiplegic shoulder after stroke" to be explored from the perspective of all the participants in the event. This information is personal and subjective and suggested that the study would be best informed by a qualitative approach. However, there were background aspects which were

objective and which provided important contextual information; these were clearly collectable using a quantitative approach and it became apparent that a mixed methods study would allow the subject to be explored more widely and effectively. This supported the development of a practice based proposal based on a pragmatic (mixed methods) paradigm; the primary data sourced was qualitative and this was supported by quantitative information in order to provide context.

From a personal perspective I considered the propositional knowledge utilised in order to support clinical decisions within this sphere of practice as a “real entity”. It is recorded in text books and has been subjected to peer review over many years. The scientific information regarding anatomy, physiology and pathology underpins health care practice (medicine, nursing, allied health) and forms part of the physiotherapy curriculum which is overseen by the professional body. Thus, I considered its content had been validated and could be regarded as a concrete entity. Experiential learning was likely to be more varied. However, undergraduate practice based learning is directed by the registration requirements for the Health and Care Professions Council and the Chartered Society of Physiotherapy. These bodies monitor the standard of practice of therapists after qualification therefore I considered that there was also a degree of uniformity and collective agreement.

Thus behind the subjective experience of making decisions with regard to the content and delivery of treatment for the hemiplegic upper limb, the interpretation and application of “knowledge” to the requirements of a specific person and to their life lay an “agreed reality” about stroke presentation and physiotherapy in its broadest sense. Intervention is based on scientific theory and interventions have intended aims/effects on defined anatomical and physiological structures/systems

2.8 Mixed methods research: Pragmatism

Traditionally research questions were considered to align with one or the other methodologies. However, a number of authors (Hammersley, 2004; Silverman, 2011; Morgan, 2014) suggested that although true for some questions there are others which would benefit from using both traditions to inform the design and proposed a third methodology: Pragmatism.

This is based on a flexible approach which considers the aims and contexts of a study and is aligned to the research question rather than to a defined philosophical stance (Cresswell, 2009; Silverman, 2010 and 2011; Morgan, 2014). Authorities suggest that that the philosophy of a methodology in providing study legitimacy should be determined by its procedural value to generate rigorously authentic knowledge; that qualitative and quantitative methods should be considered as research tools rather than competing and contradictory approaches (Cresswell & Plano Clark, 2011).

Indeed, Robson (2002; 20) takes the perspective that differences between the traditions can be viewed as technical rather than epistemological; thus enabling the enquirer to ‘mix and match’ methods according to the needs of a particular study and Ritchie (2013) suggests that a pragmatic (mixed methods) approach allows an issue to be explored from a wider perspective.

2.8.1 Philosophy of pragmatic research

Pragmatism is derived from the concept that the meaning and effect of an action or belief are inter-related. Actions are contextual, their effects are linked but not necessarily causative and they are based on shared opinions and beliefs (Morgan, 2014: 26). Pragmatists argue that although reality exists independently of human experience it is encountered through human experience. Thus knowledge about the world is a social (rather than a metaphysical) construct and the methodological focus of pragmatic research

is the nature of an experience, the consequences of action and the examination of shared beliefs.

Thus, although qualitative and quantitative research may be considered metaphysically incompatible, Pragmatists reconcile this and integrate findings through assumption of mutual relevance to answering a research question. Pivotal to this is belief that concepts such as realism, constructivism and pragmatism are human creations and continually reshaped consequent to use. Knowledge is not treated as an external reality but as one of many possible ways of considering social research and should be judged on the range of actions that it makes possible (Ritchie *et al*., 2013; Morgan, 2014).

2.8.2 Pragmatic research and physiotherapy

Physiotherapy practice is based on integrating findings from objective assessment with subjective contextualising information provided by the client. Therefore, integration of the two within research is consistent with current practice paradigm (Herbert & Higgs, 2004; Lindquist *et al*, 2006; Shaw, Connelly & Zecevic, 2010).

Shaw, Connelly and Zecevic (2010) further argue that matching physiotherapy research design to current practice would increase application of research evidence into physiotherapy practice (Bithell, 2000; APTA, 2001; WCPT, 2002; Gibson & Martin, 2003; CPA, 2006; Dean, 2008). Mixed methods research has been proposed to support studies requiring evaluation of population-based results as well as individual experiences with health interventions (Cresswell & Plano Clark, 2011) and has been used to contribute to the understanding of clinical decision making by rehabilitation professionals (Pincus *et al*., 2006).

From the perspective of research in physiotherapy Shaw, Connelly and Zecevic (2010) suggest that Pragmatism offers a realist perspective of the

physical world in conjunction with a constructionist perspective of the social world and conclude that the integration of both quantitative and qualitative inquiry is a powerful means of addressing research about clinical practice.

2.8.3 Pragmatic research design: integrating qualitative and quantitative approaches

Pragmatic research methodology supports the use of “Mixed methods” research through which data collected through qualitative and quantitative methods are integrated. However, care must be taken in construction of the research design in order to address the underlying premises of the paradigm.

Morgan (2014: 98) suggests that fundamental to this is linking of the methods so that one method “enhances the effectiveness” of another. This includes integration through convergent findings (methods support one another), additional coverage (methods augment one another) and sequential studies (the strengths of one method are developed further by the different strengths of the other method). The order of the sequencing depends on the role of the supplementary method; in a preliminary position as input to the core method or in a follow up position as an extension.

Morgan (2014) acknowledges that qualitative research is inductive and discovery orientated and quantitative research is deductive and theory testing. However, that emergence of patterns and broader context demonstrate the additional benefits that can result from a more systematic examination of quantitative data as an input to the core qualitative method. This provides Philosophical coherence to pragmatic mixed methods studies; preliminary quantitative designs recognise that qualitative methods emphasize in-depth examination of data from a small group. This requires selecting appropriate participants to permit detailed study of a specified phenomenon within a defined context. The breadth and data collected via the preliminary quantitative method complements the depth and narrow focus and provides forum for purposive selection of participants consistent with the core qualitative method (Morgan, 2014: 93).

The study presented in this thesis used a sequential contribution from related studies in which the results of the quantitative preliminary methodology were used to support/develop qualitative core methodology. The quantitative method provided deductive, objective and generalised information to enhance the performance of the core qualitative method by guiding purposive sampling and establishing areas to explore further (Ritchie *et al*., 2013; Morgan, 2014).

2.9 Service user involvement

Increased involvement of service users in the design of public services evolved from the policies of the Conservative government of the 1980s. This initiated a paradigm shift from what was described as Medical Professional domination of the NHS to a customer service model run by professional managers (McLaughlin, 2009). This is embedded within Department of Health directives, standards and guidelines (GB: Department of Health, 1989; 1995; 1997).

Current Health care provision is based on ensuring Health Care Professional accountability (Newman, 2000) and developing partnerships with users and carers (Balloch & Taylor, 2001). However, Turner and Beresford (2005) identified that despite increased service user involvement in design of health and social care policy there is still little direct involvement in research. Hanley *et al*., (2004) modified the original classifications suggested by Arnstein (1971) and identified four levels of client involvement in research: summarised in Table 2.2

Title	Description
Tokenism	Service users are not included in design or impact of outcome
Consultation	Ideas or issues raised have impact on the outcome but users/carers are not involved in planning
Collaboration	Service users are involved in planning and can identify where their suggestions have impacted on the research study design
Service user controlled	Service Users determine the research focus, research process, interpretation of findings and conclusions

Table 2.2 Classifications of service user involvement Hanley *et al*., (2004) adaption of Arnstein's original categories (1971).

There is debate regarding the degree to which studies which do not involve user participation have relevance for a client group. Minkler and Wallerstein (2003) and Turner and Beresford (2005) expressed the viewpoint that only emancipatory research supports user empowerment. In contrast, Kitson (2002) and Humphries (2003) argued that users lack the research and specialist subject knowledge required for true involvement. However, there is support for a "middle ground approach" and acknowledgement of the value of equal partnership between users and professionals (Pawson *et al*., 2003) and the value of reciprocity, mutual respect and shared learning (Dewar, 2005; Reed, 2005; Steel, 2005).

It remains difficult for small (time limited) studies to involve service users in design and planning. However, the role of the patient as "expert" regarding their own condition and experiences (GB: Dept of Health, 2001; Fleming, 2005; Hodgeson & Canvin, 2005) is acknowledged. This is embedded within studies of client perspective with regard to aspects of service delivery and objectives and the use of that experience to contribute to theory building

(Fleming, 2005; Hodgeson & Canvin, 2005). This belief supports dissemination of results to client groups and their involvement in identifying the focus of future research based on the findings of the preliminary study. Thus studies reflect awareness of the potential needs of target service user groups, understanding of their issues and requirements and ensures the end product does not reflect only academic and professional considerations (McLaughlin, 2009).

2.10 Insider research

Practitioner Research involves HealthCare professionals undertaking research studies in their own area of practice (Reed & Procter, 1995), frequently in their own work environment in order to improve practice. There are limitations inherent in this, chief of which is that exploring or making an informed judgement on an area of practice might challenge the status quo (Costley, Elliot & Gibbs, 2010).

However, there are specific benefits from such studies. In addition to building research skills, knowledge and practice of the researcher and therefore of the professional work force there are positive effects to the area of practice. This type of research explores areas useful to the Healthcare professions and projects undertaken provide evidence to influence policy and decision making within the defined area of practice. Practice theory which is generated or extended has greater credibility because it has been created by a member of the practice community involved (Reed & Procter, 1995; Costley, Elliot & Gibbs, 2010).

This is based in part on the unique perspective which an insider brings to practice related research; specialist background knowledge, in-depth theoretical and experiential understanding of specific issues and awareness of complexity relevant to areas being studied (Costley, Elliot & Gibbs, 2010). Additionally, insiders may be permitted access to people and information which would not be possible under other conditions (Costley, Elliot & Gibbs,

2010). The practice community and the individual practitioner benefit from the reflexivity and reflection required of the researcher regarding their professional role. In addition to building research skills and knowledge there can be considerable impact on the individual practice of the professional (Costley, Elliot & Gibbs, 2010).

However, there are areas affecting practice based research which must be addressed specifically in relation to “Insider” researchers. Structural issues include constraints of funding, resources, opportunities and limited location. Political pitfalls result from challenging the value system of the organisation or professional field, interviewing colleagues, conscious or unconscious lack of impartiality. Researchers may find it challenging to interpret data generated objectively, experience problems maintaining anonymity and confidentiality over the extended period of time of a work relationship rather than a short term research project, and struggle to manage power implications and potential conflicts of dual roles within a work a based project (Reed & Procter, 1995; Costley, Elliot & Gibbs, 2010).

Undertaking research within one’s own area of practice implies an additional or changed role and participants may not consider the insider researcher to be neutral (Reed & Procter, 1995; Costley, Elliot & Gibbs, 2010). Authors suggest that researchers consider the power implications secondary to their role in the organisation. This may impact on the information shared by participant colleagues as Insider status might confer advantages or disadvantages. Research participants may share more information because the practitioner role informs the researcher about context from the outset. Conversely it may limit sharing because the researcher is not perceived to be neutral and may constitute a threat. Thus the need to balance potential findings against the ethical risk of failing to ensure objective distance and biasing data (Reed & Procter, 1995; Robson, 2002; Cresswell, 2009; Costley, Elliot & Gibbs, 2010). Further, aspects of the researcher’s other role may be affected consequent to the need for reciprocity: in return for the cooperation of colleagues to collect research data the researcher may

negotiate or conform in some other aspect of their work (Reed & Procter, 1995; Costley, Elliot & Gibbs, 2010).

Insider researchers should take these factors into account when designing a project. Favourable ethical review should be gained from both academic and professional perspective. Stakeholders in both areas should be fully informed and consulted, and the process of data collection and interpretation must be rigorous (Reed & Procter, 1995; Robson, 2002; Cresswell, 2009; Costley, Elliot & Gibbs, 2010). Overt awareness of the trust of participants with regard to their vulnerability and authenticity means ensuring that data included is only that consented for (Reed & Procter, 1995; Cresswell, 2009). Careful attention must be given to participant feedback, initial data evaluation, triangulation of methods in data gathering and awareness of issues represented in the project (Reed & Procter, 1995; Costley, Elliot & Gibbs, 2010). Reflexivity should be used to support impartiality in data analysis by highlighting to the researcher their stance on issues revealed and potential for impartiality and bias (Robson, 2002; Boud, 2006).

Methodological literature about qualitative research endorses the value of close relationships with respondents in order to enhance rapport and suggests that this enriches the findings. However ethical risk of failing to ensure objective distance and biasing data by appearing more like a personal friend (or even the opposite) should be noted.

The value of “Membership” research is uncertain; this requires that participants check and verify interview transcripts and the interviewer’s interpretation. Interviewees may not agree with the interpretation (especially of sensitive issues or areas where interpretation is critical) or understand the theoretical issues involved in the research and this has potential to direct or constrain findings. Kvale and Brinkman (2009) emphasises that interpretation in social research includes framing of participant contributions within their own theoretical scheme and argues that researchers generally

take “ownership” of findings and few involve participants in interpretation and reporting of research findings.

2.11 Reflexivity

It is acknowledged within the qualitative research paradigm that the researcher is part of the process and that despite attempts to strive for empathic neutrality and avoid conscious or systematic bias the attitudes, beliefs and opinions of the researcher may unconsciously influence all parts of the process (Ormston *et al*., 2014). Thus data collection, analysis and interpretation cannot be considered to have been achieved from an objective and neutral perspective (Schultz 1994; Crotty 1996; Cresswell, 2009; Neale, 2009; Ritchie *et al*., 2013).

Although imported bias is largely unconscious and researchers attempt to limit the influence of their values and personal opinions in order to accurately record and report the respondents information about their life experiences and to avoid imposing their own understanding and construction on data analysis (Ahern,1999; Roberts, 2002; Cresswell, 2009; Ritchie *et al*., 2013) it is acknowledged that within qualitative research practice researcher is part of that which they are studying (Frank, 1997; Cresswell, 2009; Roberts, 2002; Ritchie *et al*., 2013).

It is an important practice for the credibility of qualitative research that the researcher reflects on and identifies potential bias which may have affected their engagement with the process and data (Ahern, 1999; Roberts, 2002; Cresswell, 2009; Ritchie *et al*., 2013). Experts advise that the researcher should explicitly identify, values, personal background, past experiences and aspects related to the research setting or participants which could influence or affect conscious or unconscious interpretation and discussion (Roberts, 2002; Morgan, 2006; Cresswell, 2009; Ritchie *et al*., 2013).
This information should be reported to the reader in order to inform their understanding of the strategic, ethical and personal issues of the researcher

which may underpin the research findings. This includes the question itself, the means of data collection and the method of analysis. Thus the reader can review the conclusions drawn in context in order to determine if bias resulting from either the conscious or unconscious stance of the researcher has influenced this in any way (Koch & Harrington, 1998; Locke, Spirduso & Silverman, 2007; Ormston *et al*., 2014).

Payne and Payne (2004) and Neale (2009) additionally suggest that reflexivity benefits the researcher drawing their attention to their personal feelings, beliefs, values and attitudes and the potential effect of these on the people and settings being researched. Therefore, this reflexive account of my own potential influence on this study is presented below:

My interest in physiotherapy for clients' after stroke developed as a consequence of my interest in the physiology underpinning the working of the central nervous system. From a treatment perspective the effect of damage to other areas was relatively discrete in comparison with the global effect of damage to this pivotal area of motor control. From the outset I found it fascinating, incredibly challenging and very satisfying if one could "solve" any part of the problem. However, I was always aware of the profound impact of stroke on the client and their family and I became increasingly frustrated at my lack of knowledge and the difficult in designing and delivering treatment which would support meaningful changes to their motor control.

My interest fuelled attendance on a number of postgraduate courses (primarily about the Bobath concept) between 1990-2000, during which time my career developed from junior to senior clinical positions. I enjoyed the neurophysiology lectures but was often frustrated by my lack of skill and the lack of description regarding specificity of objectives and rationale behind alignment of the therapists' body and hand positions. Thus my first declaration of potential bias is an alignment towards the Bobath concept; tempered by underlying frustration regarding the way it is taught and the

poorly substantiated claims made for its mode of action and efficacy when delivered by relatively inexperienced practitioners.

From the beginning of 2000 my career developed towards becoming a lecturer practitioner; this was supported by more academic exposure including completing a Master's degree and being involved in teaching under-graduate neurology and physiotherapy treatment ; this deepened and broadened my theoretical knowledge and increased my awareness of research methodologies and other treatment aspects (Proprioceptive neuromuscular facilitation, motor learning) and allayed with greater need for evidence based practice increased my awareness for the need for evidence and the difficulty in collecting, applying and disseminating it. A second area of potential bias therefore is a preference for logic and evidence over intuition; a feeling that if information isn't available this indicates that I have been looking in the wrong place. This is enhanced by my role as a lecturer and a senior clinician where I am expected to have the information to support and advice students and /or clinical staff members who are less experienced or have fewer qualifications.

However, this is allied with a strong clinical allegiance; I work as a practising therapist in neurological rehabilitation and I continue to be frustrated by the difficulty in accessing or providing evidence which is applicable to practice problems. My Master's dissertation explored the effect of weight bearing through the arm on stimulating activity in arm muscles; it was an interesting project but I structured it poorly and it didn't replicate treatment in a way that had relevance to clinical practice; a third area of possible bias then would be a desire to provide evidence that is useful to support clinicians; especially within the varied context in which neuro-physiotherapists work. Additionally, I experience in my own practice how complex client presentation can be; a fourth area of bias might be the belief that successful treatment is unlikely to be delivered through a "common, one size fits all" approach.

Finally, I observe every day the difficulty and frustration that clients' experience as a result of stroke and the frustration which is part of being in a position of dependency, sometimes enhanced by pain, fear, loneliness; thus it was important to me that in undertaking a study which gave me great advantages and interest that the people who were most affected would be included in the discussion. However, there is possible bias there, professionally I am part of the very system which I wanted to give clients' the opportunity to discuss; this meant that I had to be prepared to report and include in analysis all comments regardless of the content about physiotherapy.

Some aspects of reflexivity regarding the study have been reported as part of insider research; the potential impact of phase 1 was with regard to data analysis; areas which have been reflected on suggest that my personal experience and knowledge is within in-patient treatment using a Bobath based approach; with a high regard for theoretical or evidence informed practice. I was able to see from the data the degree of similarity which participants had to that template. It was thus important that data description and analysis for each section was done methodically so that unconscious associations were not made.

In phases 2 and 3 there were potential biases in recruiting; participants for phase 2 had indicated their agreement as part of their response to phase 1; this meant that I was positively disposed towards them for agreeing to give time to my study. Additionally, during interviewing it was hard to remain objective and not to engage in discussion which may influence the agenda and/or participant's responses by giving conscious or unconscious feedback based on my own experiences and influences which might have altered their opportunity to speak freely. Equally during data analysis there was potential for comments which matched my beliefs to be given greater weight and possibility of inclusion than those with which I was not in accord.

More so for phase 3; the physiotherapists were clinical colleagues who were known to me personally and some of whom I had worked with; I was aware of how hard it may be to allow me to view their treatment session and for them to open up to me about the rationale underpinning their clinical decisions which may have made me reluctant to ask difficult questions. Although I tried to remain neutral and to encourage “reflection” with minimal prompting this may not always have been successful and especially as I had been present at the treatment session and had already viewed the tapes it was hard not to anticipate what their actions had been and to attempt to derive information in advance of them offering it or to prompt a possible rationale based on my opinion about why they may take a particular course of treatment. Especially if something had been included that was unusual or interesting.

Finally, my belief regarding the responsibility which I felt for the clients’ who participated in phase 3 may have influenced both data collection and data analysis; in addition to feeling gratitude that they had permitted me to record their treatment session they had also consented to view their recording and to discuss their feelings and opinions with me. As I have experience of how vulnerable clients’ often feel after stroke I was very aware of the trust that was being placed in me. This belief may have reduced the depth with which I explored areas with client’s in comparison with therapists and may have accorded their discussion greater weight because of a belief that it had been more difficult for them to express.

CHAPTER 3: Phase 1: Survey of knowledge, clinical experience and beliefs of physiotherapists and current clinical interventions for treatment of the hemiplegic upper limb after stroke.

3.1 Introduction

Researchers have suggested areas of physiotherapy practice which should be addressed further: updating of treatment approaches at frequent intervals, high level documentation to support examination of the extent to which treatments achieve their stated goals, investigation of factors influencing physiotherapy treatment and development of predictive indicators so that treatment and management can be targeted more effectively according to stated criteria (Partridge & Edwards, 1996; Lennon, 2003; Tyson & Selly, 2006; Natarajan *et al*., 2008; Latimer *et al*., 2010).

Therefore, this phase of the current study aims to contribute to this body of work by ascertaining current clinical practice, describing the effect of stroke on motor control of the upper limb reported by participant physiotherapists, identifying the range of treatment options from which physiotherapists' reported they selected and considering internal and external factors related to the experience and beliefs of the physiotherapists which might influence these issues.

3.1.1 Content of neurological physiotherapy

Content of neurological physiotherapy practice was explored by identifying the degree of influence of named paradigms (primarily the Bobath concept and the Motor Relearning Process) on neurological physiotherapy treatment (Davidson & Waters, 2000; Lennon, Baxter & Ashburn, 2001). This work built on previous survey based studies (Richoch *et al*., 1995; Beeston & Simons, 1996; Sackley & Lincoln, 1996) identifying the Bobath concept as the most frequently named approach informing practice in the UK. These studies extended knowledge through reporting demographic information about therapists working in stroke rehabilitation in the UK and examining therapists'

beliefs about their practice in order to clarify the content of treatment approaches based on those beliefs (Davidson and Waters, 2000; Lennon, Baxter & Ashburn, 2001).

Important work in identifying aspects of therapy reasoning and initiating description of content to support debate regarding efficacy was undertaken by Davidson and Waters (2000). The authors cited previous studies undertaken in the UK, Australia and Sweden which demonstrated that therapists based practice decisions on experience of working with patients rather than training, supporting theory or literature review. Further, the approach most widely adopted in each country was that taught in undergraduate physiotherapy education, although it was unclear whether undergraduate courses dictated the approach used or reflected practice. Treatment in the UK and Sweden was based on the Bobath concept; that in Australia on the “motor relearning” approach.

Postal questionnaires explored participant characteristics including age, time since qualification, area of work, treatment approach, beliefs about quality of movement and the role of occupational therapists and nurses. These were distributed via superintendents to physiotherapists of all grades working in UK hospitals which accepted students on clinical placement (n=1667). Authors acknowledged that all participants worked in City based teaching hospitals and may have similar outlook and provide similar results. The response rate was high (n=1078: 65%) and 973 questionnaires (59%) were suitable for analysis.

Results identified that most respondents (88%) based treatment on the Bobath concept compared with 4% who identified the “motor relearning” programme. However, as responses also suggested frequent inclusion of other approaches in individual practice the authors concluded that in reality 87% of respondents employed an eclectic approach.

One of the most important findings of this study was identification of therapists' assumptions about their practice. Half the respondents believed that treatment outcome was dependent on physiotherapists' clinical ability and just over half (56%) that greater function resulted automatically from high quality movement. Consequently, respondents reported advising patients to delay walking until they could do so unaided, despite resultant conflict with other staff members. Moreover, results of specific questions suggested that respondents could not articulate the theoretical underpinning for their interventions. Additionally, it was suggested that the therapists' treatment perspective may influence their interpretation of the effect of that treatment.

These results provided useful background to practice approaches and interesting insight into beliefs which could be relevant to the selection and delivery of physiotherapy interventions. However, this was limited by the structure of the questionnaire which did not permit expansion on the answers.

These themes were explored further by Lennon (2003), the method of survey distribution matched that of Davidson & Waters (2000) and again response rate was high (questionnaires analysed n=722). Questionnaires allow wide data collection but limit depth of responses; this is acknowledged by the author. Additionally, the distribution excluded therapists working in Northern Ireland which limits generalizability of the results, despite the large number of respondents.

The questionnaire included four sections: participant's background, physiotherapy management and theoretical beliefs. The fourth section related to applying beliefs to gait re-education and findings were reported separately. Questions determining the aims and theoretical beliefs underpinning practice provided valuable information about practice context from the practitioner's perspective however the reporting of findings lacks consistency. For example, the proportion of respondents who worked in a designated stroke unit (14%) or on more than one area (17%) is reported but

the work location of other respondents is not provided. This could be important because it may affect stroke presentation, recovery potential or treatment need of the client base.

Equally in questions about factors causing therapists to modify their treatment respondents selected from examples determined by the author (based on modification of a questionnaire used by Nilsson & Nordhom, 1992: cited in Lennon, 2003). This was piloted and shown to differentiate between therapists using the Bobath approach and an eclectic approach. However, the use of “closed” questions limited possible responses and prevented expansion of the answers.

Despite these limitations, the results supported and extended the findings of Davidson and Waters (2000). A majority of respondents (67%) reported an affiliation to the Bobath concept and 31% used a “combination” of principles from other approaches which was described as “eclecticism”.

The lack of potential for expansion limits the author’s interpretation of the results, this is disappointing as content of assessment and theoretical beliefs are complex issues and would benefit from greater detail. However, study findings provided valuable perspective on therapists’ views about practice and demonstrated areas of discrepancy between theory and practice which Lennon (2003) suggested required further exploration. These areas included the use of valid and reliable outcome measures and task and context specificity of interventions. The paper concludes that methodological flaws of research studies therapists should continue to review their assumptions in view of updates to the theoretical evidence base.

Based on extant studies the principal components of the survey for the current study are: background demographic information and working environment, pre and post graduate clinical experience and training, observations regarding the effect of stroke on the hemiplegic upper limb, identification of interventions which could be used during treatment of the

hemiplegic upper limb and factors supporting participants' decisions about selection of intervention.

3.2 Aims and Objectives

3.2.1 Phase 1 overview

This phase generated a combination of qualitative and quantitative data in response to open and closed questions collected via a specifically designed questionnaire.

3.2.2 Phase 1 aims

To describe the effect of stroke on motor control of the upper limb reported by participant physiotherapists and to identify treatment options from which physiotherapists reported that they selected.

To consider internal and external factors related to the experience and beliefs of the physiotherapists which might influence these issues.

3.2.3 Phase 1 objectives

1. To describe the structure of physiotherapy clinical practice for the treatment of individuals who have sustained stroke.
2. To describe physiotherapy post registration training and continuing professional development related to physiotherapy treatment of the hemiplegic upper limb after stroke.
3. To describe the type and frequency of occurrence of problems affecting motor control of the hemiplegic upper limb after stroke reported by participant physiotherapists.
4. To identify physiotherapy treatment options for the hemiplegic upper limb after stroke and identify the frequency of their use reported by participant physiotherapists.

5. To investigate if there is a relationship between clinical experience (length of time in neurological practice) and reported physiotherapy practice for the hemiplegic upper limb after stroke (identification of the frequency of occurrence of specific movement problems and the frequency of use of specific interventions).

3.3 Study design

3.3.1 Overview of study design

A questionnaire was used to collect quantitative and qualitative data from participants accessed through a post-graduate specialist interest group, the Association of Chartered Physiotherapists in Neurology (ACPIN). Purposive recruitment of 143 physiotherapists who currently treat individuals after stroke was used to access a homogenous group of participants in order to support exploration of an identified area of knowledge or practice (Cressell & Plano Clarke, 2011). Respondents represented all National Health Service clinical staff grades and comparable roles in private practice and had a range of postgraduate experience in neurological rehabilitation for individuals who had sustained stroke. This permitted exploration of the theoretical constructs underpinning clinical practice decisions in a range of dimensions (conditions).

This also represents a convenience sample; identification of potential participants through their membership of ACPIN permitted access to therapists with experience of treating stroke and willingness to participate in research.

3.3.2 Sample size

Sample size was limited by the use of purposive sampling, however as Chartered physiotherapists are required to demonstrate the current-ness of their professional practice in order to maintain professional registration with

the Health and Care Professions Council (Health and Care Professions Council, 2014) most physiotherapists subscribe to a professional specialist interest group. Participants were recruited via their membership of the Association of Chartered Physiotherapists in Neurology (ACPIN). This ensured that the sample was drawn from the largest pool of therapists working in neurology available to the researcher. In addition to disseminating information and facilitating evidence based practice and Continuing Professional Development such specialist interest groups support research by maintaining a register of members prepared to participate in studies relevant to their area of practice (ACPIN, 2012). It was anticipated that this would ensure the highest possible response rate. This method of participant recruitment was supported by previous similar studies (Roger *et al*., 2002; Tyson & Selley 2006; De Wit *et al*., 2007; Donaldson, Tallis & Pomeroy, 2009).

3.3.3 Questionnaire design

As this study was explorative in nature, questions based on the literature about neurological physiotherapy practise for this client group and focusing on the broader aims of the study were assembled to form the questionnaire. This process was based upon descriptions provided by previous studies (Davidson & Waters, 2000; Lennon, 2003; Donaldson, Tallis & Pomeroy, 2009).

Information was synthesised by the author from review of recently published research papers, medical and physiotherapeutic texts and National Institute for Health and Care Excellence (NICE, 2010) and Intercollegiate Stroke Working Party: Royal College of Physicians (ISWP: RCP, 2012) guidelines for stroke. This informed construction of questions to explore respondents' opinions of: effects of stroke on muscle activity, sensation and movement; commonly used therapeutic interventions and factors which contribute to the formulation of clinical decisions in health care practice. This list was reviewed

by a small group of (neurological) physiotherapists (5) and academics (2) prior to designing the questionnaire.

The draft questionnaire was piloted with 12 physiotherapists (two academics: ten clinicians) in order to check for face validity and to ascertain that the questions were understandable and un-ambiguous. Modifications (in lay out and wording) were made in response to their suggestions. Involvement of both academics and clinicians in review of the questionnaire design and content ensured face and content validity, ensured that focus remained relevant and that questions were easy to interpret.

The final questionnaire (see Appendix i) based on extant related surveys and clinical experience comprised 28 questions which represent the principal components of the questionnaire; divided into five parts:

A. Background demographic information about participants (age, qualifications, number of years of experience as a physiotherapist treating patients with Central Nervous System pathology/dysfunction).
B. Participants post-graduate clinical and educational experiences and influences.
C. Structure and clinical remit of participants working environment.
D. Service based influences on participants' treatment of clients who have had stroke (staffing, Multi-professional team availability and working practice).
E. Participants' opinions and observations of the effect of stroke on the hemiplegic upper limb, the type of interventions which could be used during treatment and the factors which influence their decisions about selection of intervention.

3.3.4 Validity

Face and Content validity were established by review of the draft version by Chartered physiotherapists with a range of clinical and academic experience

relevant to physiotherapy practice in neurology (two academics holding postgraduate Master of Science degrees in physiotherapy and teaching qualifications, two clinical physiotherapists holding postgraduate Master of Science degrees in neurological physiotherapy, five clinical physiotherapists holding Bachelor of Science (Honours) degrees in Physiotherapy and one clinical physiotherapist holding a diploma in physiotherapy) and the questionnaire was amended in response to their comments. Participants were recruited from a group with specific knowledge of the topic being investigated (an interest in neurology, experience in assessing the effect of stroke on movement and of selecting and delivering a physiotherapeutic intervention) applied across a broad spectrum of locations in all regions of the country and across the entire pathway of care (acute and long-term) for individuals following stroke. This was intended to reduce the possibility of geographic or exclusion bias and increased the likelihood of valid responses in relation to the subject and of those responses representing the range of clinical areas which constitute physiotherapy practice in treatment of stroke across the United Kingdom.

However, respondents were self-selected from a group of ACPIN members who had indicated willingness to participate in providing research data; this selection bias of a subgroup from a specific group of physiotherapists working in neurology may have impacted on the range and transferability of the data collected (Edwards *et al*., 2004; Larsson & Gard, 2006; Plummer *et al*., 2006).

3.4 Data collection

3.4.1 Ethical approval

Ethical approval for this study was obtained from Northumbria University Research and Ethics Committee (28.11.11) and the Integrated Research Application System (City Road and Hampstead; Project number: 12/LO/0819

received 19.09.12), (Appendix ii). Completing and returning the questionnaire was considered to indicate respondents consent to participate in the Survey.

3.4.2 Pilot study

The e-mail link for distributing the questionnaire was piloted with a small group of therapists (n=10) working in neurological rehabilitation and known to the lead researcher. These therapists accessed, completed and returned the survey to the lead researcher using the system proposed for the research methodology. Feedback was obtained regarding the ease of electronic access, the questionnaire format, difficulties experienced in completing and returning it electronically. No problems were reported.

Answers from the pilot questionnaires were coded and entered into the research data base using the system proposed for the research methodology. No problems were apparent. Data from pilot participants who met the inclusion criteria (ACPIN members working in stroke rehabilitation) were retained to use as part of the main trial.

3.4.3 Data collection procedures

Recruitment for this study was via The Association of Chartered Physiotherapists Interested in Neurology (ACPIN) in order to ensure selection from a group of physiotherapists with experience in the treatment of stroke. A central mailing list of professional addresses for contacts was obtained from ACPIN and members who worked in acute and long term stroke rehabilitation and who had indicated their willingness to be contacted to participate in providing research data were contacted either by post (163), or email (1285) according to the preference registered with ACPIN. Questionnaire packs and email attachments contained an information sheet and cover letter (see Appendix iii), the questionnaire and (for mailed responses) a stamped return addressed envelope. Mail and email

responses were coded to allow tracking of replies; this coding was not used for any other purpose. After four weeks a reminder and a further hard copy or email (linked to the questionnaire via “survey monkey™”) was sent out to non-responders. All responses were combined for analysis.
In total 1428 potential participants were approached, twenty-nine “out of office” replies and amendments of practice to exclude stroke were received and 143 respondents returned completed questionnaires: 73 by paper and email, 70 by “survey monkey”.

This phase of the study took place over July and August 2012 because of ethical considerations and this may have affected the response. This period includes all or part of the school summer recess in the United Kingdom and is likely to be a period of high levels of annual leave. The current-ness of the ACPIN mailing list is dependent upon members informing the secretary of changes to their status; a small number of those contacted returned messages that they were on maternity leave and preferred not to participate in research studies at that time.

3.4.4 Data Analysis

Questionnaire responses were analysed using appropriate descriptive reporting (of median data, interquartile ranges and percentage frequency of response) using computer software SPSS® (statistical package for social sciences) version 21 (Chicago, Illinois).

Qualitative data obtained from open – ended questions were examined using a content analysis approach to extract themes and categories (Huberman & Miles, 2002; Alreck & Settle 2004, Saldana, 2009).

3.5 Results

The response rate from the questionnaires was 10% (Email, n=73; Survey Monkey, n=70), total sample n=143 of 1428

3.5.1 Background demographic information

Section 1 of the questionnaire collected demographic information about the respondent therapists.

3.5.1.1 Age

The age range of respondents was between 21 and 60+ years (Table 3.1). Most respondents were between 31 and 40 years of age (40.5%) and a further 24.5% was aged 41-50. Thus although information has been provided by therapists drawn from a wide age range (interquartile range (IQR) is 21-50 years) 63.6% of respondents were under 40 years of age. This may reflect the proportion of older therapists in the profession, physiotherapy is physical in nature and currently the professional pension is available from the age of 55 years. Older therapists (51-60+) may have comprised a small proportion of the total group of respondents (11.9%) because others have retired or taken up managerial positions.

In contrast twenty-three per cent of respondents were aged 21-30 years; this is possibly because the source of the participants was a professional special interest network (Association of Chartered Physiotherapists Interested in Neurology); younger therapists (21-30) may not have selected a speciality and therefore may not be members of specific Professional networks.

Age range (years)	**Number of responses (n=143)**	**Percentage of respondents (%)**
21- 30	33	23.1
31- 40	58	40.5
41- 50	35	24.5
51- 60	14	9.8
Over 60	3	2.1
Median 31-40 years; lower quartile 21-30 years; upper quartile 41-50 years. Interquartile range 21-50 years.		

Table 3.1 Age of respondent

3.5.1.2 Physiotherapy qualification

Respondents represented all types of physiotherapy award eligible for membership of the Chartered Society of Physiotherapy (CSP) and registration with the Heath and Care Professions Council (HPCP). The

largest proportion of respondents (58.7%) held a Bachelor of Science (Honours) degree which was the median qualification, 18.1% of respondents held diplomas or graduate diplomas in physiotherapy and almost the same proportion (16%) held post registration Master's degrees. Only a very small number (2.8%; n=4) of respondents had a pre-registration Master of Science (physiotherapy) and slightly more (3.5%; n=5) held doctorates (Table 3.2).

Highest qualification in physiotherapy	**Number of responses (n=143)**	**Percentage of respondents (%)**
Diploma or Graduate Diploma	26	18.1
Bachelor of Science (Honours) Physiotherapy	84	58.7
Master of Science (Physiotherapy) Pre-registration	4	2.8
Master of Science (Physiotherapy/Neuro-Rehabilitation) Post-registration	23	16.1
Doctorate	5	3.5
No response	1	0.7
Median: Bachelor of Science (Honours) Physiotherapy		

Table 3.2 Respondents' highest qualifications in physiotherapy

Of the 23 respondents who held post - registration Masters degrees seven also held a diploma or graduate diploma in physiotherapy, nine held Bachelors of Science (BSc. Honours) in Physiotherapy and seven did not record their initial qualification. Four of the five respondents who held doctorates also held Bachelor of Science (Honours) physiotherapy degrees; the other respondent did not indicate their initial qualification and one person did not answer this question (Table 3.3).

Highest qualification in physiotherapy	Other physiotherapy qualifications		
	(Graduate) Diploma	BSc Honours	Not recorded
Doctorate		4	1
Post registration Master of Science (n=23)	7	9	7

Table 3.3 Breakdown of respondents' highest qualifications

3.5.1.3 Post graduate clinical experience

The number of years qualified as a physiotherapist ranged between 0-5 years (3.5%; n=5) and over 40 years (n=1). The median range (21 - 30) years also represented the largest percentage of respondents (25.2%), although another large proportion of respondents (18.9%) had been qualified between 11 and 20 years (see Table 3.4). The interquartile range was wide; lower quartile (6-10 years), upper quartile 21-30 years. Forty-three respondents did not answer this question, possibly because it overlapped with the following one about the length of time that they had worked in physiotherapy with clients who had neurological problems/injury/dysfunction.

Time since qualification (years)	Number of responses (n=143)	Percentage of respondents (%)
0- 5	5	3.5
6- 10	21	14.7
11- 20	27	18.9
21- 30	36	25.2
31- 40	10	7.0
Over 40	1	0.7
Response	99	69.2
No response	43	30
Median (21 - 30) years; lower quartile (6-10 years); upper quartile 21-30 years Interquartile range (6-30 years)		

Table 3.4 Number of years since qualification

3.5.1.4 Clinical experience specific to neurology

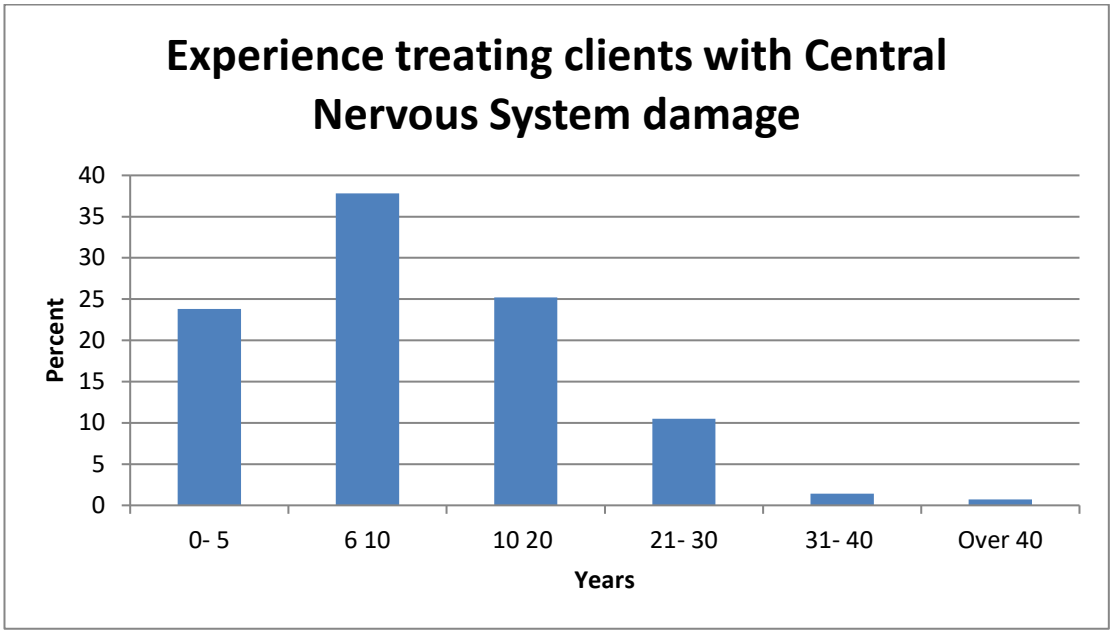
In addition to the number of years since qualifying to practice physiotherapy, respondents' were asked to indicate how long they had worked specifically

with clients' who had movement problems resulting from damage to the central nervous system. The largest percentage of respondents had worked with this client group for 6-10 years (38% of participants). A further 25% of participants had worked in specialist neurological posts for 11-20 years (see Table 3.5) and 10.5% for between 21 and 30 years which indicated that just over a third (35.5%) of respondents had more than 10 of years of experience working with this client group. At the opposite end of the data range 23.8% of respondents had worked with this client group for 0-5 years, consequently the median range was 6-10 years. However, the lower quartile was also 6-10 years and upper quartile 11-20 years; interquartile range 6-20 years of experience specific to neurology.

Time working in post specific to neurology (years)	**Number of responses (n=143)**	**Percentage of respondents (%)**
0 - 5	34	23.8
6 - 10	54	37.8
11 - 20	36	25.2
21 - 30	15	10.5
31 - 40	2	1.4
40+	1	0.7
No response	1	0.7
Median 6-10 years; lower quartile 6-10 years; upper quartile 11-20 years; Interquartile range 6-20 years of experience specific to neurology.		

Table 3.5 Years of experience treating clients with central nervous system damage/dysfunction

Figure 3.1 Experience treating clients with central nervous system damage/dysfunction



3.5.1.5 Staff grade of respondents

This question has most relevance for staffs working within the National Health Service pay structure and was included in order to provide information about seniority and skill level in addition to that indicated by the "number of years of clinical experience". Five respondents did not answer this question and a further seven reported that they did not work within this structure (Table 3.6).

Band (National Health Service)	**Number of responses (n=143)**	**Percentage of respondents (%)**
8 a, b, c	15	10.5
7	53	37.1
6 (rotational/static)	60	42.0
5 (rotational/static,)	3	2.1
Private practice, Non-National Health Service	7	4.9
No response	5	3.5
Median band 6; lower quartile band 6; upper quartile band 7; Interquartile range from band 6 - band 7.		

Table 3.6 Seniority/banding of respondent

This data indicated that respondents were drawn from the middle to high end of the NHS clinical pay grades which extend from graduate entry level at band 5 (3.1%, n=3) to managerial grades 8 a, b and c (10.5%, n=15). The largest group of respondents (42%) was drawn from band 6 (specialist physiotherapist) and band seven (highly specialist physiotherapist), 37.1%. In total 89.6% of respondents were of at least one grade above graduate entry level and 47.6% from specialist physiotherapist pay grades (band 7 and above); this indicates high levels of clinical skill within this group. This is supported by the median placement at band 6 and the interquartile range from band six to band seven.

3.5.2 Post graduate educational experiences and influences

In order to comply with the Health and Care Professions Council (HCPC) requirement to demonstrate post graduate continuing professional development (CPD) and to meet the selection criteria for senior positions it is common practice for physiotherapist to access further training in specialist areas of practice after graduation (HCPC, 2013). The author compiled a list of “commonly accessed” post graduate training courses from information in the physiotherapy professional journal and synapse (the publication associated with membership of ACPIN) and the core content of practical modules for bachelors and Master’s physiotherapy students at the University of Northumbria. This list was reviewed by a small group of therapists (five) and academics (two) and felt to be complete. Respondents were asked to indicate which courses from the list they had attended in the last five years and to amend this to include any which had not been included.

Post graduate courses which were not on the original list and were identified by three or more respondents have been included in this report. These were “Saeboflex” ™ (dynamic splinting), constraint therapy, neurological theory courses and short (less than two day) courses related to treating the upper limb using the Bobath concept. A number of respondents identified attendance on “study days” about physiotherapy for the upper limb but the

content and underpinning paradigm (for example, normal movement, Bobath concept or strength and conditioning) was not specified in their response. These have been amalgamated and included using the generic term “upper limb courses”.

3.5.2.1 Post graduate courses

Thirty-three respondents (23.1%) indicated that they had not attended a post-graduate course in the preceding five years. Data provided by respondents about courses attended (Table 3.7) is reported as a percentage of total respondents group for each course; because some respondents attended more than one course the cumulative total of attendance for all courses is greater than 100%.

Course type attended in past 5 years	Number of responses	Percentage of all respondents (%) (n=143)	Percentage of respondents who HAD attended a course (%) (n=110)
Bobath concept weekend course	40	28	36.4
Basic Bobath concept course	28	19.6	25.5
Advanced Bobath concept Course	23	16.1	21.0
Motor Re-learning concept course	34	23.8	30.1
Vestibular rehabilitation	35	24.5	32.0
Un-specified “upper limb” courses	14	9.8	12.7
Hydrotherapy	11	7.7	9.0
Functional Electrical Stimulation	11	7.7	9.0
Saeboflex™	7	4.9	6.4
Massage	6	4.2	6.4
Proprioceptive Neurological Facilitation	4	2.8	3.6
Constraint therapy	4	2.8	3.6
Bobath concept upper limb courses	4	2.8	3.6
Splinting	4	2.8	3.6
Neurological theory courses	3	2.1	2.7
Attended no post graduate courses	33	23.1	

Table 3.7: Postgraduate courses attended in by participants in the preceding 5 years

3.5.2.1(a) Neurology "concept" based courses

Weekend courses based on the Bobath concept were attended by 28% of respondents (n=40); this represents the course with the highest attendance, followed by vestibular rehabilitation (24.5%; n=35). A slightly larger proportion of respondents had attended courses aimed at Motor Re-learning (23.8%; n= 34) than those attending basic courses based on the Bobath concept (19.6%; n=28) or advanced courses based on the Bobath concept (16.1%; n=23). However, 91 respondents (63%) had attended at least one Bobath related course (weekend, basic and advanced courses) over the past five years. Bobath specific upper limb courses were attended by 2.8% of respondents and non - Bobath specified upper limb courses were attended by 9.8%.

3.5.2.1(b) Treatment skills based courses

Eleven respondents (7.7%) had attended a course aimed at functional electrical stimulation (although it should be noted that this may not have been directed exclusively at treatment of the arm) and this equalled the number attending hydrotherapy courses. Seven people (4.9% of respondents) had attended a course aimed at using "Saeboflex" ™, this is a form of active splinting and is in addition to those who attended specific splinting courses (2.8%) some respondent may have attended more than one course. Massage courses were attended by 4.9% of respondents (n=6) which is slightly more than those who attended proprioception neuromuscular facilitation and constraint therapy courses, 2.8% (n=4).

3.5.2.2 Influence of attendance on a neurology based post- graduate course

Respondents were asked to indicate on a 5 point "Likert" scale the level of influence that attendance on a post-graduate course had on their selection and the delivery of treatment for the hemiplegic upper limb. Options were: "completely", "a lot", "partially", "very little" and "not at all, answers could be supplemented by comments.

Most respondents indicated that attendance on a postgraduate course had affected both the selection and delivery of treatment. The effect was slightly larger for treatment selection; 8.4% of respondents reported that attendance had affected their choice of treatment completely and 44% reported “a lot” of influence. Treatment delivery was only marginally less; 6.3% reported that the course had affected their treatment delivery completely and 42.7% that it had affected it “a lot”. Forty-seven people (32.9%) and 51 people (35.7%) felt that they had based their treatment selection and delivery only partially on attendance at neurology based courses and only 3 (2.1%) and 2 (1.4%) people felt that there had been no influence at all on either selection or delivery of an intervention (see Table 3.8).

Half of respondents felt that attendance at a neurologically based post graduate course had influenced their selection (52.5%) and/or delivery (49%) of an intervention for the hemiplegic upper limb either “completely” or “a lot”; the median indicator in both cases was “a lot”. Interquartile range for effect of attendance on a neurological course on treatment selection and delivery was a little wider: for both treatment selection and delivery the lower quartile was “partially” and the upper quartile “a lot”.

The value accorded to the influence of neurological post graduate courses is supported by the number of respondents (n=109) who made additional comments; these were grouped around the themes presented below (see Table 3.9) and are presented in full in Appendix iv.

Level of effect	Effect of attendance on neurological physiotherapy course in last 5 years on selection of treatments (number of respondents)	Effect of attendance on neurological physiotherapy course in last 5 years on selection of treatments (percentage (%) of respondents)	Effect of attendance on neurological physiotherapy course in last 5 years on delivery of treatments (number of respondents)	Effect of attendance on neurological physiotherapy course in last 5 years on delivery of treatments percentage (%) of respondents
Completely	12	8.4	9	6.3
A lot	63	44.1	61	42.7
Partially	47	32.9	51	35.7
Very little	3	2.1	2	1.4
Not at all	1	0.7	1	0.7
No response	17	11.9	19	13.3
Median value	4		4	
Interquartile range (Q1-Q3)	3-4		3-4	
The median and interquartile values were assessed on a 5 point Likert scale where 1=not at all, 2= very little, 3= partially, 4=a lot, 5=completely.				

Table 3.8 Effect of (neurological) post graduate courses attended in the preceding five years on selection and delivery of treatment

Theme Code	Theme description	Subtheme/category code	Subtheme/category description	Number of comments
T1	Increased theoretical knowledge	A	Increased knowledge/ understanding of neurological theory	12
		B	Increased ability to make theory: practice links	14
		C	Improved clinical reasoning	10
T2	Application of research into practice	A	Current-ness of research knowledge	8
		B	Application of evidence based practice	14
		C	Reflection	7
T3	Increased skill related to practice	A	Improved skill of assessment	9
		B	Improved delivery of existing areas of competence	30
		C	Development of new skills	6
T4	Increased range of practice			43
T5	Networking			2

Table 3.9 Themes identified in relation to value of attendance on post graduate neurological course

Further responses were grouped around five themes; some respondents included more than one theme. Themes identified were:

- Increased theoretical knowledge (36 comments)
- Application of research into practice (29 comments)
- Increased skill (45 comments)
- Increased range of practice (43 comments)
- Networking (2 comments)

Responses suggested that the greatest effects of attendance on a postgraduate neurological course were to increase range of practice and

develop therapeutic skills; other valued effects were to increase theoretical knowledge and ability to apply research to clinical practice. These themes were further reduced into categories.

Respondents who identified that course attendance increased their theoretical knowledge suggested that this was within three areas:

- Increased knowledge/ understanding of neurological theory
- Increased ability to make theory: practice links
- Improved clinical reasoning

Respondents who identified that course attendance increased their ability to apply research into practice suggested that this was within three areas

- Current-ness of research knowledge
- Application of evidence based practice
- Reflection

Respondents who identified that course attendance increased skill related to practice suggested that this was within three areas:

- Improved skill of assessment
- Improved delivery of existing areas of competence
- Development of new skills

Respondents commented positively on the value which they ascribed to developing clinically relevant knowledge and skills and the access provided by postgraduate courses to “expert” teaching (although the term expert was not defined) and the opportunity to receive informed feedback about technical aspects (viz: “handling” as part of Bobath concept based therapy- although this term was not defined) of physiotherapy treatment. A small number of respondents commented on difficulty transferring skills for Bobath concept based courses to treatment in the community or where there were few supporting staff members to work with.

3.5.2.3 Influence of attendance on a non-neurology based post- graduate course

It can be seen that attendance on a non- neurological course was considered to have less effect on physiotherapy practice for clients with Central Nervous System dysfunction than attendance on neurological post graduate course. The median value lies in the “partially” effect band and only one person (0.7%) felt that the course had affected their selection of treatment completely (unfortunately this respondent did not identify the course). The percentage of respondents who indicated each level of effect is more evenly distributed for non-neurological than for neurological courses; 16.1% of respondents indicated that attendance at a non-neurological course had affected their selection and /or delivery of treatment “a lot”, 30.8% felt that both aspects had been affected “partially” and a further 12.6% (selection) and 14% (delivery) identified that the course had “very little” effect.

Level of effect reported	**Effect of attendance on non-neurological physiotherapy course in last 5 years on selection of treatments (number of respondents)**	**Effect of attendance on non-neurological physiotherapy course in last 5 years on selection of treatments (percentage (%) of respondents)**	**Effect of attendance on non-neurological physiotherapy course in last 5 years on delivery of treatments (number of respondents)**	**Effect of attendance on non-neurological physiotherapy course in last 5 years on delivery of treatments (percentage (%) of respondents)**
Completely	1	0.7	0	0
A lot	23	16.1	23	16.1
Partially	44	30.8	44	30.8
Very little	18	12.6	20	14.0
Not at all	24	16.8	22	15.4
No response	22	7.7	24	7.0
Not applicable	11		10	
Median value	3		3	
Interquartile range (Q1-Q3)	2-3		2-3	
The median and interquartile values were assessed on a 5 point Likert scale where 1=not at all, 2= very little, 3= partially, 4=a lot, 5=completely.				

Table 3.10 Effect of (non- neurological) post-graduate course attended in the preceding five years on selection and delivery of treatment

However, the importance accorded to the influence of non-neurological post graduate courses is supported by the number of respondents (n=59) who made additional comments, these were grouped around the themes presented below (Table 3.11) and are presented in full in Appendix v.

Theme code	**Theme description (number of comments)**	**Subtheme /category code (number of comments)**	**Subtheme/category description**
T1 (11)	Knowledge (35)	A (11)	Increased knowledge from other areas of physiotherapy practice – general observation
		B (7)	Increased knowledge from other areas of physio areas –Musculo-skeletal
		C (4)	Pain relief
		D (6)	Core stability/balance
		E (4)	Soft tissue mobilisation
		F (1)	Vision
		G (2)	Strapping/orthotics
T2 (7)	MDT working (3)		
T3	Management skills (6)		
T4	Communication/ goal setting (7)		

Table 3.11 Themes identified in relation to value of attendance on post graduate non-neurological course

Further responses were grouped around four themes; some respondents included more than one theme. Themes identified were:

- Knowledge (37 comments)
- MDT working (3 comments)
- Management skills (6 comments)
- Communication/goal setting (7 comment)

The largest number of comments was generated in relation to increasing knowledge of physiotherapy practice; this was further reduced to specific

domains of knowledge (e.g. musculo-skeletal practice, relief of pain, core stability, vision and strapping).

Specific therapies were identified; these included respiratory treatment, myofasical release, mirror box therapy for pain relief and cognitive behavioural therapy. A smaller number of respondents identified the value they had derived from attendance on courses related to communication (informed consent, capacity for decision making and equality and diversity) and the insight provided by managerial training courses (cost effective treatment, aspects of leadership) or those fostering effective multi-profession team working.

3.5.3 Effect of published research read by respondent in the past five years

Respondents were asked to indicate on a five point "Likert" scale the level of effect which they felt that published research had on their selection and the delivery of treatment for the hemiplegic upper limb; answers could be supplemented by comments.

Level of effect reported	**Effect of a piece of published research read in last 5 years on selection of treatments**		**Effect of a piece of published research read in last 5 years on delivery of treatments**	
	Number of respondents	**(percentage) of respondents**	**Number of respondents**	**(percentage) of respondents**
Completely	6	(4.2)	5	(3.5)
A lot	47	(32.9)	42	(29.4)
Partially	49	(34.3)	44	(30.8)
Very little	19	(13.3)	29	(20.3)
Not at all	4	(2.8)	4	(2.8)
No response	18	(12.6)	19	(13.3)
Median value	3		3	
Interquartile range (Q1-Q3)	3		3	
The median and interquartile values were assessed on a 5 point Likert scale where 1=not at all, 2= very little, 3= partially, 4=a lot, 5=completely.				

Table 3.12 Reported effect of published research read in preceding five years on selection and delivery of treatment

Responses suggested that the value of the information derived from published research is high; 4.2% (n=6) identified that a piece of research had influenced their treatment selection “completely” and 32.9% (n=47): “a lot”. With respect to delivery of treatment 3.5% (n=5) reported that it had influenced treatment delivery “completely” and 29.4% (n=42): “a lot”. However, 13.3 % (n=19) of respondents considered research evidence had very little influence on their selection and 20.3% (n=29) on the delivery of their treatment and 2.8% that it had no influence at all (although in such a small sample this relates to only four people).

Further information was provided by 85 respondents (Table 3.13)

Responses were grouped around four themes; some respondents included more than one theme. Themes identified were:

- Increased knowledge (30 comments)
- Cochrane reviews Research based Guidelines/protocols (6 comments)
- Specific area of research identified (77 comments)
- Hasn’t changed practice (7 comments)

Theme code	Theme description	Sub-theme/ category code	Subtheme/category description	Number of comments
T1	Increased knowledge	A	Personal reading to keep up to date	10
		B	Reading for or as part of courses/journal clubs	8
		C	Misc. comments re increased knowledge	12
T2	Cochrane reviews Research based Guidelines/protocols			6
T3	Specific area identified	A	Value of Stretching	4
		B	Constraint induced movement therapy	18
		C	Intense early rehab	12
		D	Task/function related practice	10
		E	Mirror therapy	9
		F	Bilateral upper limb tasks	7
		G	Mental Imagery	1
		H	Splinting	7
		I	Strengthening/Saeboflex	4
		J	Functional Electrical Stimulation	4
		K	Botulinum toxin	1
T4	Hasn't changed practice			7

Table 3.13 Themes identified in relation to value of published research on selection and delivery of treatment

In general, the comments in relation to the effect of research on practice were positive and in addition to general comments about the value of research to increase knowledge (n=12) comments suggested that this was done as part of personal reading to keep up to date (n=10) and /or reading for or as part of courses/journal clubs (n=8). Some respondents suggested that their engagement with published research was “second hand” and because the applicability of research findings were discussed at postgraduate courses or during in-service training sessions. Others identified that these had been the “trigger” for their own further reading.

Respondents further suggested that in order to access recent evidence which had been reviewed by “experts” and was consider applicable to practice they used Cochrane reviews and professional guidelines (n=6). The questionnaire did not ask respondents to identify how often they read research papers or how confident they felt in interpreting and applying the findings.

A large number of additional comments identified specific areas of research which respondents felt had influenced their practice of which the most popular were: constraint induced movement therapy (n=18), intense early rehabilitation (n=12), task/function related practice (n=10), mirror therapy (n=9), bilateral upper limb tasks (n=7), splinting (n=7). Seven respondents indicated that research findings had not altered their practice (justifications were: the lack of research support for one specific treatment paradigm, difficulty translating/applying research practice conditions to clinical conditions (especially in relation to time) and the lack of patient motivation for some therapies (e.g. intensive practise). Other limitations for adopting the findings of research into practice were that ‘many researchers conclude that “more research is needed”’, “No single study has been enough in itself to convince me to alter practice but when there is a body of work that is more convincing” and identified the need “to be aware of the quality of some published research cannot immediately adopt into clinical practice”.

3.6 Structure and clinical remit of participants working environment

3.6.1 Area of physiotherapy practice

Participants were drawn from a number of clinical settings (Table 3.14), 74% of respondents worked for the National Health Service (NHS) and 10% in private practice, a further 3% worked in “other” settings (primarily based in research) and 13% of respondents did not provide this information. National Health Service settings included either in-patient Stroke Units for acute treatment (7.7%) or rehabilitation (16.8%) and a further 18.9% of respondents worked across both areas. 21% of therapists treated patients in their own home environment after discharge from hospital as part of “Early Supported Discharge (5.6%) and Community stroke (15.4%) teams; 7.7% provided care in a hospital outpatient department, 13% of respondents did not provide this information.

Area of physiotherapy practice	**Respondents**	
	Number	**Percentage (%)**
Hospital wards (not stroke specific)	3	(2.1)
Hospital acute stroke Unit	11	(7.7)
Stroke Rehabilitation Unit	24	(16.8)
Stroke/Neuro (mixed acute and rehab)	27	(18.9)
Stroke early supported discharge	8	(5.6)
Community neuro/stroke team	22	(15.4)
Hospital out patients department	11	(7.7)
Private practice	14	(9.8)
Other	4	(2.8)
No response	19	(13.3)

Table 3.14 Area of physiotherapy practice

It cannot be clearly derived from the information provided by respondents but it is likely that the services provided to the most acute stroke client group are in hospital wards (2.1%, n=3) and hospital acute stroke unit (7.7%, n=11)

and that stroke rehabilitation units (16.8%, n=24) and early supported discharge teams (5.6%, n=8) provide therapy for those clients in early but not acute stage of recovery. Thus, 9.8 % of respondents treat very acute stroke, 22.4% treat early but less acute clients and this is augmented by the 18.9 % who work on units which do not differentiate in relation to time since stroke. Physiotherapy during later stages of recovery is provided by respondents working in community teams (15.4%, n-22), hospital outpatient departments (7.7%, n=11) and private practice (9.8%, n=14); in total 32.9%. Thus the experience of respondents of stroke treatment is across all levels of recovery which increases the validity of the information provided.

Four respondents reported that their area of practice was relevant to stroke but did not match any of these clinical areas but did not give more details and 19 respondents did not answer this question.

3.6.2 Experience in treating stroke

3.6.2.1 Stroke as a proportion of client group treated

This study employed purposive selection of potential respondents based on their indication to ACPIN that stroke comprised part of their clinical practice; in order to explore these further respondents were asked to indicate the three conditions which they treated most commonly, results are shown in Table 3.15

	Number of responses	**Percentage of respondents**
Stroke is only or most common condition treated	89	62.2%
Stroke is second most common condition treated	22	15.4%
Stroke is third most common condition treated	7	4.9%
Stroke is not one of three most common condition treated	6	4.2%
No response	19	13.3%

Table 3.15 Proportion of stroke within respondents' clinical practice

Despite the differences in area of clinical practice participants had considerable experience in treating stroke. It can be seen that stroke comprises a large part of respondents' clinical practice; a large majority (66.2%, n= 89) see clients' after stroke as either their only client group or that which they treat most frequently and for a further 15.4% of respondents, clients with stroke was the second largest group attending for treatment. In total 82.5% (n=118) of therapists reported that stroke was one of the three groups of clients seen most commonly. Six respondents (4.2%) do not treat stroke as one of the three most common but do treat clients after stroke and 19 people (13.3%) did not answer this question.

3.6.2.2 Case load - number of clients after stroke treated over a week

There was some variation in the number of patients seen by a therapist over a week, 32.9% of therapists reported that they treat fewer than 5 clients in a week and a further 32.2% reported treating between 6 and 10 patients. This suggests that 65% of therapists treat fewer than 10 people at any one time. The median number of patient treated by a participant in a week was between 6 and 10, note: this represents the total number of clients on a therapists' work load and not the number of therapy sessions provided in a week (Table 3.16).

Number of clients after stroke treated over a week	**Number and (percentage %) of respondents**
0-5	47 (32.9)
6-10	46 (32.2)
11-20	20 (14.0)
21-30	2 (1.4)
31-40	2 (1.4)
40+	2 (1.4)
No response	25 (17.5)

Table 3.16 Caseload - number of clients after stroke treated over a week

3.6.3 Length of treatment time

Government and Royal College of Physicians guidelines (ISWP: RCP, 2012; “NHS” Commissioning board, 2013) suggest that physiotherapists should deliver up to 45 minutes of therapy if a client is able to tolerate that amount of time. The response suggested that 33.6% (n= 48) of respondents treated their clients for between 31 and 45 minutes and a further 22.4% (n= 32) reported that minimum treatment time would be between 45 and 60 minutes; this suggest that 56% of clients usually receive a minimum of between 31 and 60 minutes of treatment time during a session. Conversely, almost the same proportion of respondents (30.8%, n= 44) reported that between 31 and 45 minutes would be the maximum time that they would spend with a patient during a single treatment session, this suggested that clients may sometimes be offered less treatment time than the minimum recommended.

A small number of therapists (3.5%, n=5) reported that the maximum time they could allocate for treating one patient was 15 minutes or less and 12.6% (n =18) reported that they would usually spend between 15 and 30 minutes; thus 16% of therapists surveyed reported routinely spending less than 30 minutes with a patient during a typical treatment; this is less than the RCP guidelines. However, the survey did not permit therapists to comment and this may be because the type of work undertaken by these respondents requires a shorter time (for example clinic based consultation).

The median value for both minimum and maximum time is “3” (31-45 minutes) but the inter quartile range spread of values (representing the middle 50% of the data set) for minimum treatment time is 2-4 (between 16 minutes and 60 minutes) and the inter quartile range spread of values for maximum treatment time is 3-4 (between 31 minutes and 60 minutes). Twenty-four (16.8%) of respondents indicated a difference in minimum and maximum treatment time, all other respondents recorded a single time range (Table 3.17).

Time (Minutes)	Minimum treatment time (Number of responses)	Minimum treatment time (Percentage of respondents) (%)	Maximum treatment time (Number of responses)	Maximum treatment time (Percentage of respondents) (%)
0-15	14	9.8	5	3.5
16-30	21	14.7	18	12.6
31-45	48	33.6	44	30.8
45-60	32	22.4	43	30.1
60+	4	2.8	9	6.3
No response	24	16.8	24	16.8
Median	3		3	
Interquartile range	2-4		3-4	
The median and interquartile values were assessed using a 5 point Likert scale where 1=0-15 mins, , 2= 16-30 mins, 3= 31-45 mins, 4=45-60 mins , 5=more than 60 mins				

Table 3.17 Maximum and minimum minutes of physiotherapy offered

3.7 Service based influences

Service based influences on participants' treatment of clients who have had stroke, this included staffing, Multi-professional team availability and working practice.

3.7.1 Physiotherapy team structure

Respondents were asked to indicate in addition to themselves how many therapists of each grade were working as part of the team (Table 3.18)

	Number and Percentage (%)					
	Band 8	Band 7	Band 6	Band 5	Technical Instructor	Assistant
Respondents working with this grade	26 (18)	61 (42.7)	81 (56.6)	60 (42.0)	87 (60.8)	35 (24.5)
No response	23 (16.1)	19 (13.3)	18 (12.6)	18 (12.6)	18 (12.6)	18 (12.6)

Table 3.18 Physiotherapy team in addition to respondents

Responses suggest that although respondents worked with other therapists of all grades access was greater to grades of Band six (56.6%, n=81), equally spread between Band seven (42.7%, n=61) and Band 5 (42.0%, n=60), there was a high representation of technical instructors (60.8%, n=87), a slightly smaller number of assistant grades (24.5% n=35) and that respondents were least likely to have access to working with a Band eight (18%, n=26).

3.7.2 Effect of team structure on selection and delivery of treatment

Respondents were asked to comment about how they felt that working with other members of the physiotherapy and multi professional team influenced the decisions that they made related to selection and delivery of physiotherapy treatment. Fifty-six respondents answered this question. Further responses were grouped around three themes; some respondents included more than one theme.

Themes identified were:

- Purpose of treatment (5 comments)
- Skill /knowledge of individual providing assistance (63 comments)
- Safety of client, therapist or person providing assistance (9 comments)

The largest number of comments was in relation to the interaction between the lead therapist and the person providing assistance during the treatment, these comments were reduced further to categories.

- General observations regarding the knowledge/skill of the person providing assistance (25 comments).
- More senior staff acting as teachers/instructors developing skills of junior staff (9 comments).
- Treatment altered secondary to the level of skill of the individual providing assistance – more skilled assistance allows more complex handling/facilitation/treatment (14 comments).

- Treatment altered secondary to the level of skill of the individual providing assistance – less skilled assistance allows less complex handling/facilitation/treatment (15 comments)

Responses suggested that although treatment offered by a physiotherapist was dependent on the movement problems which the client demonstrated; some movement difficulties would benefit from a physiotherapy specific approach but for other problems the in-put of another profession as part of a joint treatment session would be desirable. Physiotherapists identified that the content of the treatment would be different under these two conditions. Physiotherapy for clients after stroke may require the input of more than one person; the responses suggested that treatment content was influenced by the level of knowledge and skill of the lead therapist and all assisting persons. If all persons involved in the treatment had high levels of skill and experience a treatment of greater complexity could be offered. Respondents suggested that on occasions they acted as the skilled lead therapist, and on other occasions they requested that another therapist lead the session in order to provide treatment at the required level and to develop their own therapeutic skills further through experiential learning. If skilled assistance was not available, then the treatment offered would be less complex.

Finally, comments suggested that the safety of clients, therapists and assistants was also considered and that this may influence treatment sessions with regard to content and /or the position in which a client could be supported in order to work on treatment for a specific movement.

3.8 Participants' observations about effect of stroke on movement control

Physiotherapists make detailed observations of clients' movements in a variety of situations and these support diagnostic and therapeutic clinical decisions in relation to the way in which the motor control of an individual client differs from what is considered to be their "pre-stroke" baseline. The assessment and interpretation of features of normal and dysfunctional motor control following stroke and the selection and delivery of treatment will be

reported in more detail in phase 2. Data gathered via questionnaire in phase 1 in relation to the reported observed effects of stroke and treatment options was intended primarily to provide wider scope and context and to support deeper exploration in phase 2.

3.8.1 Observed effect of stroke on the hemiplegic upper limb

Respondents were asked to consider a list of suggested effects of stroke on the hemiplegic upper limb and to indicate using a five point “Likert” scale the frequency with which they observed these within their clinical practice. Respondents were also invited to augment the list to include any features which had not been included; no augmentations were suggested and only one respondent made a comment (this questioned the author’s use of the term “reduced muscle activity” rather than “weakness”). Those areas observed most frequently are reported below (Table 3.19) and reported in full in Appendix vi.

The feature observed most commonly by respondents was “movement with altered pattern” which 17.5% (n=25) of respondents reported as observing, “always”, 37.1% (n=53) as “usually” and 24.5% (n=35) as “often”. The median value for this observation was also high (3: often) and the interquartile range 3-4 (often-usually). This indicates that despite the number of therapist working in acute and early stage rehabilitation 79.1% identified a “movement “problem rather than no movement as the most frequently observed feature of stroke on the hemiplegic upper limb.

Less often but still frequently observed was reduced grip and reduced muscle activity; although only 4.2% (n=6) of respondents reported reduced grip as “always” present 36.4% (n=52), felt that it was “usually” and 35% (n=50) that it was “often” a feature. The median value was 3 (often) and the interquartile range 3-4 (often-usually).

Reduced muscle activity/tone was observed “always” by 8.4% (n=12) or respondents and a further 39.2% (n=56) encountered this “usually” and 28%

(n=40): “often”; the median value was 3 (often) and the interquartile range 3-4 (often-usually). It is consistent with the possibility that these features are related; low tone leading to reduced grip that observed frequency should be similar.

Slightly less frequently observed were “Movement with altered range” (MAR) and “Movement with reduced coordination” (MRC): both of which recorded a median value of 3 (often) and interquartile range 2-4 (sometimes-usually). Movement with altered range was observed a little more frequently: always: 14.7% (n=21) and “usually”: 30.8% (n=44), compared with MRC: “always” 5.6% (n=8) and “usually”: 20.1% (n=30). Note that 15.4% of respondents did not answer this question.

Effect of stroke on motor control of the upper limb	**Median**	**IQ**	**Reported frequency of observation – number and (percentage) of respondents**					
			Always	Usually	Often	Sometime	Never	No response
Reduced muscle activity/tone	3	3-4	12 (8.4)	56 (39.2)	40 (28)	13 (9.1)	0	22 (15.4)
Movement with altered pattern	4	3-4	25 (17.5)	53 (37.1)	35 (24.5)	8 (5.6)	0	22 (15.4)
Movement with altered range	3	2-4	21 (14.7)	44 (30.8)	41 (28.7)	15 (10.5)	0	22 (15.4)
Reduced coordination	3	2-4	8 (5.6)	30 (20.1)	54 (37.8)	29 (20.3)	0	22 (15.4)
Reduced grip	3	3-4	6 (4.2)	52 (36.4)	50 (35)	13 (9.1)	0	23 (16.1)
The median and interquartile values were assessed using a 5 point Likert scale where 1= never, 2= sometimes, 3= often, 4=usually, 5 always								

Table 3.19 Reported most frequently observed effect of stroke on the upper limb

3.9 Modalities employed most frequently by physiotherapists in treatment of the hemiplegic upper limb

Respondents were asked to indicate how often they employed identified modalities and invited to augment the list to include any modalities which had not been included; a small number of therapists additionally identified "Saeboflex" ™ splinting (n=6) and mirror box therapy (n=8) but the frequency of use was not indicated; therefore, these modalities have not been included in the reported results. Those modalities employed most frequently are reported below (Table 3.20) data from all responses are available in Appendix vii.

Modality	**Median**	**IQ**	**Frequency of use number and percentage of respondents**					
			Alway	Usually	Often	Sometime	Never	No response
Facilitatory handling	3	2-4	35 (24.5)	36 (25.2)	33 (23.1)	15 (10.5)	2 (1.4)	22 (15.4)
Motor re-learning	3	2-4	13 (9.1)	28 (19.6)	47 (32.9)	27 (18.9)	6 (4.2)	22 (15.4)
Postural training	3	2-4	13 (9.1)	34 (23.8)	33 (23.1)	37 (25.9)	4 (2.8)	22 (15.4)
Muscle stretching	3	2-4	9 (6.3)	29 (20.1)	38 (26.2)	42 (29.4)	2 (1.4)	23 (16.1)
Joint mobilisation	3	2-3	7 (4.5)	22 (15.4)	45 (31.5)	42 (29.4)	5 (3.5)	22 (15.4)
Strengthening	4	2-4	26 (18.2)	48 (33.6)	29 (20.3)	15 (10.5)	2 (1.4)	23 (16.1)
Sensory stimulation	3	2-4	20 (14.0)	28 (19.6)	43 (30.1)	25 (17.5)	3 (2.1)	24 (16.8)
Functional activity	4	3-5	55 (38.5)	45 (31.5)	17 (11.9)	3 (2.1)	1 (0.7)	22 (15.4)
The median and interquartile values were assessed using a 5 point Likert scale where 1= never, 2= sometimes, 3= often, 4=usually, 5 always								

Table 3.20 Most frequently used modality during treatment for the hemiplegic upper limb after stroke

As can be seen from Table 3.20 the intervention identified as being most commonly selected by respondents was “functional activity”; indeed 38.5% (n=55) of respondents reported that this “always” formed part of their intervention and only 1 person suggested that they would “never” include this in treatment. The median value for this observation was 4 (usually) and the interquartile range 3-5 (often-always).

This was closely followed by “strengthening” which 18.2% (n=26) identified as using, “always” and 33.6% (n=48) as “usually” including; again the median value was 4 (usually) although the interquartile range of 2-4 (sometimes-usually) was slightly less than for functional activity. Less often but still frequently used were: facilitatory handling, “Motor relearning”, postural training, muscle stretching, joint mobilisation and sensory stimulation. The median (3) suggested that these “often” comprised part of treatment and the interquartile range 2-4 (sometimes-usually) were the same for all of these interventions. Note response to each part of the question varied and between 26 (18.2%) and 22 (15.4% of respondents did not provide this information.

3.10 Factors influencing clinical decisions

Respondents were asked to use a five point Likert scale to indicate the level to which they felt the factors listed influenced their clinical decisions; additionally, they were invited to augment the list to include any factors which had not been included. Respondents (n=3) provided one further suggestion (feedback from relatives and carers) but did not indicate the level to which it influenced their practice therefore it is not included in the reported data. Factors with the greatest influence are reported below (Table 3.21).

Factor	Median	IQR	Level of influence (percentage of respondents)					
			Completely	A lot	To some extent	Very little	Not at all	No response
Clinical experience	4	4-5	42 (29.4)	74 (52.8)	4 (2.8)	0 (0)	0 (0)	23 (16.1)
Theoretical knowledge	4	3-4	33 (23.1)	70 (50)	17 (11.9)	0 (0)	0 (0)	23 (16.1)
Post graduate courses	4	3-4	11 (7.7)	64 (44.8)	38 (26.6)	6 (4.2)	1 (0.7)	23 (16.1)
In-service training	3	3-4	6 (4.2)	38 (26.6)	64 (44.8)	9 (6.3)	3 (2.1)	23 (16.1)
Professional guidelines	3	3-4	10 (7.0)	48 (33.6)	50 (35.0)	11 (7.7)	1 (0.7)	23 (16.1)
Patient's suggestions/ feedback	3	3-4	8 (5.6)	48 (33.6)	58 (40.6)	5 (3.5)	0 (0)	24 (16.8)
Research published in journals	3	2-4	4 (2.8)	38 (26.6)	64 (44.8)	14 (9.8)	0 (0)	23 (16.1)
Advice from other staff members	3	2-4	3 (2.1)	48 (33.6)	56 (39.2)	10 (7.0)	2 (1.4)	24 (16.8)
Information published in books	3	2-3	1 (0.7)	21 (14.7)	59 (41.3)	38 (26.6)	1 (0.7)	23 (16.1)
Information derived by attending conferences	3	2-3	1 (0.7)	32 (22.4)	59 (41.3)	25 (17.5)	3 (2.1)	23 (16.1)
Government policy	2	1-3	3 (2.1)	20 (14.0)	43 (30.1)	38 (26.6)	16 (11.2)	23 (16.1)
Hospital Protocols	2	1-3	7 (4.9)	17 (11.9)	40 (28.0)	29 (20.3)	25 (17.5)	25 (17.5)
The median and interquartile values were assessed using a 5 point Likert scale where 1= never, 2= sometimes, 3= often, 4=usually, 5 always								

Table 3.21 Factors with greatest influence on clinical decisions

The factor identified by respondents as being the most likely to influence a clinical decision was "clinical experience"; median 4 (a lot), interquartile range 4-5 (a lot -completely). Thirty-three respondents (23.1%) suggested that this would influence the decision "completely" and a further 50% (n=70) that it would influence the decision "a lot". This factor was closely followed by

“theoretical knowledge” and attendance on postgraduate courses (see section 3.7.2.1), median 4 interquartile range 3-4 (to some extent-a lot). Slightly less influential (median 3; to some extent) (interquartile range 3-4; to some extent-a lot) were: in-service training, professional guidelines and the suggestions and feedback provided by the patient.

3.11 The effect of clinical experience (length of time in neurological practice) on factors influencing clinical decisions

Respondent physiotherapists identified clinical experience and theoretical knowledge as the factors of primary influence towards a clinical decision. Secondary important areas of influence were research published in journals and information published in professional guidelines. Clinical practice requires client: therapist interaction and feedback from clients was also identified as an important component in clinical decision making.

The participant group was selected specifically from physiotherapists who had worked in neurology and it can be seen (section 3.9.2(a)) that “post-stroke” comprises the largest or only client group for most respondents and part of the three largest client groups for ALL respondents. However, the length of time working specifically in neurology (section 3.7.5) varies from 1 year to more than 40 years.

3.12 Phase 1 discussion

3.12.1 Summary of findings

Phase 1 of the study aimed to describe reported practices of UK physiotherapists working in rehabilitation for individuals after stroke. Survey questions were related to both service structure and factors personal to the therapists’ selecting and delivering the treatment. This included: service venue, staffing and amount of treatment offered, therapists’ education, post graduate training and experience, views on presentation of movement

dysfunction resulting from stroke and identification of potential physiotherapy interventions.

Responses were received from all areas of the United Kingdom but were not analysed in relation to country or geographical region; most responses (18/143: 12.6%) were from therapists practicing as part of NHS provision which is accountable to central government therefore there is no reason to suppose that this would differ according to region although it should be acknowledged that service structure in Scotland may differ a little from that in England and Wales.

Work has been published which explores some aspects of the survey; in particular, clinical decision making in relation to novice/expert status and the weighting accorded by physiotherapists to the existing evidence base in comparison with their undergraduate and postgraduate training, experiential learning and peer support. However, this survey included new aspects of these areas by exploring the context in which decisions are taken; this included the influence of working with other staff members, the frequency of encounter with specific clinical presentations after stroke and the value accorded to specific physiotherapy interventions. This expands the knowledge of the factors contributing to decisions made in this area of practice.

This chapter will discuss the results of this study in relation to physiotherapy practice for rehabilitation of the hemiplegic upper limb after stroke and influences on the selection and delivery of physiotherapy interventions. Future areas for research will be identified.

3.12.2 The structure of physiotherapy clinical practice for the treatment of individuals who have sustained stroke

3.12.2.1 Age and qualification

Results of this survey suggested that neurological clinical practice for stroke rehabilitation is delivered by therapists of all ages and holding all

physiotherapy qualifications eligible for registration with the health and care professions council. However, the group of respondents demonstrated a trend toward therapists between the ages of 21 and 40 years, holding a Bachelor of Science (Honours) degree in physiotherapy. This may represent the physical nature of physiotherapy in general and neurological practice in particular; currently the professional pension is available from the age of 55 years, older therapists (51-60+) may have comprised a small proportion the total group of respondents (11.9%) because others have retired or taken up managerial positions. Physiotherapy has been an all graduate profession since 1992 (Moffatt, 2012); the qualifications of respondents for this study reflect this.

This is important because professional and government practice guidelines are based on a requirement for evidence to support clinical decisions; those who have undertaken Bachelor's or higher degree level qualifications have been shown to have greater familiarity and confidence with accessing and interpreting research literature to support practice decisions (Green, Petty & Harrison, 2007; McGlynn & Cott, 2007; Petty, Scholes & Ellis, 2011; Moffatt, 2012), although conversely it has also been suggested that academic programmes may promote computer literacy skills rather than the ability to use the information sourced (Griffiths & Riddington, 2001) and that a mismatch may exist between the level of confidence of new graduates in the methodology of evidence- based practice and their ability to implement their knowledge and skills in the practice setting (Caldwell *et al*., 2007).

Thus, the responses to the survey from degree level therapists may have a firm base in published evidence but a number of older practitioners may not be as comfortable with accessing this material. Additionally, because the survey population tends toward younger therapists with a degree the responses may not be representative of the entire population of physiotherapists treating stroke.

3.12.2.2 Clinical experience specific to neurology and staff grade of respondents

Respondents reported a varied length of time in specific neurological practice; from less than five years (23.8%) to more than 20 years (10.5%) so data were likely to be relevant to a wide range of clinical practitioners. Additionally, 35.5% of respondents had more than 10 of years of experience working in rehabilitation after stroke and this is considered indicative of expert practice (Case, Harrison & Roskell, 2000).
This level of expertise was supported by the staff grades of the respondents (although it should be noted that five respondents did not answer this question and a further seven indicated that they could not respond because they did not work within the NHS pay- band structure). This data indicated that respondents were drawn from the middle to high end of the NHS clinical pay grades; almost half (42%) were specialist physiotherapists and a second half (47.6%) were highly specialist physiotherapists. This indicates high levels of clinical skill within this group, although once again this may mean that the data collected does not represent the experiences and opinions of all staff working in stroke rehabilitation.

There is a considerable body of work examining the effect of expertise on clinical decision making: practitioners who have been working in a specific clinical area for a period of time have been shown to relate to factors influencing clinical decisions in a different way from those with less experience (novice). Research suggests that experts demonstrate greater psychosocial sensitivity and self-monitoring, view the information that they collect about patients more holistically than novices, describe their findings more precisely and accurately and use a more logical and organised reasoning process and place greater reliance on tacit and personal experiential knowledge and are more likely to use metacognition and reflection in decision making (Case, Harrison & Roskell, 2000; Jensen *et al*., 2007).

This suggests that the data collected for this survey should include information generated from expert and novice reasoning styles and should therefore be applicable across a wider application of physiotherapists working in neurology.

3.12.2.3 Area of physiotherapy practice

The structure of services for the treatment of stroke in the UK is primarily influenced by the Royal College of Physicians National Clinical Guidelines for Stroke (ISWP: RCP, 2012:15) which identifies the need for a "commissioning portfolio which encompasses the whole stroke pathway from prevention through acute care, early rehabilitation …..and later rehabilitation in the community".

The influence of these recommendations was apparent in the responses received; 74% of respondents worked for the National Health Service (NHS) across a range of clinical settings which matched areas of service provision identified in the RCP guidelines. These included 'hyper-acute' (first 72 hours) and 'acute' in-patient Stroke Units (44% of respondents), service delivery to patients who are able to transfer independently or with assistance of one person (see RCP guidelines: 18) in their own home environment after discharge from hospital as part of "Early Supported Discharge" and "Community" stroke specialist teams (21%), a further group (7.7%) saw clients in hospital out patients departments.

However, stroke presentation is time sensitive, clinical presentation and movement loss differ during the transition from acute to chronic (Penta *et al*., 2001; Sommerfield *et al*., 2004). Although authorities emphasize variation in recovery time (Scottish Intercollegiate Guidelines Network, 2008; ISWP: RCP, 2012) stroke guidelines consider the "hyper acute" stage of stroke to extend over the first 72 hours, presentation to be "acute" during the first two weeks of recovery and chronic after three-six months. Consequently, therapists working in hospital based acute and inpatient rehabilitation units may observe different patterns of effect and employ different treatment

modalities in comparison with those working in community based acute/rehabilitation services and it is valuable to this study that the respondents worked with clients across a large range of settings and time frame post stroke. This range of provision reflects the need to support clients with stroke of varying severity and effect and although it increases the generalizability of the survey results it may also impact on the homogeneity of the data collected in relation to movement dysfunction and treatment prescription. Although it is beyond the scope of the current study differences in physiotherapy practice for this client group at different points in the pathway warrants further investigation.

Despite the differences in area of clinical practice participants had considerable experience in treating stroke. In total 82.5% (n=118) of responding therapists reported that stroke was one of the three groups of clients seen most commonly and a large majority (66.2%, n= 89) treated clients after stroke as either their only or their largest client group. This implies that respondents are well informed about practice for this client group, which increases the validity of the responses.

3.12.2.4 Rehabilitation treatment quantity (intensity of therapy)

Evidence suggests that face-to-face therapist–patient contact time after stroke in the UK is lower than in other European countries (De Wit *et al*., 2005; De Wit *et al*., 2006; Putman *et al*., 2006; Putman *et al.,* 2007) and authors acknowledge that that it is important to determine if there is a minimum threshold for the amount of therapy, below which there is no benefit at all.

Government and Royal College of Physicians guidelines (ISWP: RCP, 2012) suggest that physiotherapists should deliver up to 45 minutes of therapy if a client is able to tolerate that amount of time. The responses suggested that half of respondents were able to meet that target and offered clients a minimum of between 31 and 60 minutes of treatment time during a session (31 to 45 minutes, 33.6%; n= 48; 45 to 60 minutes, 22.4%; n= 32). However,

this indicated that half of respondent group is NOT able to offer clients the minimum time recommended for rehabilitation after stroke (31to 45 minutes 30.8%, n= 44; 15 to 30 minutes, 12.6%; n =18; 15 minutes or less, 3.5%, n=5). Indeed, 16% of therapists surveyed reported routinely spending less than 30 minutes with a patient during a typical treatment.

Although there is some evidence to show that more intense therapy can improve functional outcomes (Kwakkel, Kollen, & Wagenaar, 1999; Langhorne & Pollock, 2002; Van Peppen *et al*., 2004; Langhorne, Coupar & Pollock, 2009) this is limited and authors suggest that further work is required. In addition to determining how much therapy is required to be therapeutically effective robust indictors should be developed to establish those clients' who require treatment delivered by a physiotherapist and those who would benefit equally from less specialist input.

It is acknowledged that the intervention and support offered should be matched to client need, time since stroke, level of recovery and potential for change (Verheyden *et al*., 2013) and further investigation is required in order to support service provision and development.

3.12.2.5 Service based influences

Service based influences on participants' treatment of clients who have had stroke included staffing, Multi-professional team structure and working practice. This is especially relevant when guidelines which influence Government policy advocate review of the structure of the service for this client group and review of the role of the physiotherapist in delivering interventions (ISWP: RCP, 2012).

Responses suggest that although respondents worked with other therapists of all grades access was greater to grades of Band six (56.6%, n=81), equally spread between Band seven (42.7%, n=61) and Band 5 (42.0%, n=60), there was a high representation of technical instructors (60.8%, n=87), a slightly smaller number of assistant grades (24.5% n=35) and that

respondents were least likely to have access to working with a Band 8 (18%, n=26) although it should be noted that 10.5% (n=15) of the respondents were band 8's and would therefore be expected to work with staff of a lower grade.

Although this suggests that services are delivered by staff of all grades, it is interesting that the highest proportion of staff which was available to work with respondents was "specialist" physiotherapists (band 6; 56.6%, n=81) and technical instructors (60.8%, n=87). This acknowledges client requirements for a service which can provide both skilled and intensive interventions.

Interestingly, responses to other parts of the survey identify the impact of the skill and knowledge of the clinician on treatment and suggest that further research is required in order to determine the interventions and skills which are needed for this client group.

3.12.2.6 Team structure

As stated previously the value of Multi-Disciplinary Team working has been determined as part of the success of stroke units and is one of the core recommendations for stroke rehabilitation. Responses (n=56) suggested that working with another person had an effect on both selection and delivery of intervention and that this related in part to the role of the second (or third) person. Although respondents did not provide detailed rationale their answers suggested that they considered separate MDT members to have specialist and different roles from one another; this is supported by the work of De Wit *et al*., (2006) and Gamble (2013).

Responses suggested that although treatment offered by a physiotherapist was dependent on the movement problems which the client demonstrated; some movement difficulties would benefit from a physiotherapy specific approach but for other problems the in-put of another profession as part of a

joint treatment session was desirable. Respondents identified that the content of the treatment would be different under these two conditions. Working with occupational therapists was identified as contributing to rehabilitation of function, working with speech and language therapists as part of providing background posture to allow rehabilitation of aspects of speech and swallowing. Interestingly respondents did not report situations in which other therapists used their skills (for example with communication or knowledge of praxis) to contribute to movement based physiotherapy input; this may reflect the way that the question was worded. Although respondents identified working to achieve “joint” functional goals with occupational therapists, responses suggested that these comprised “separate” therapy sessions and that the content differed because of the input from the other professions.

The greatest number of comments was in relation to the interaction between the individuals providing the treatment and suggested that when two therapists worked together the level of skill and knowledge of both therapists influenced the degree of “difficulty” of the treatment that could be offered, and therefore influenced decisions related to selection/delivery of intervention. This seemed to have two strands; the degree of technical skill required and the ability to use a similar knowledge base to inform treatment so that overt explanation did not interrupt the “flow” of the treatment. Therapists reported that they asked for (or provided) assistance to other staff member in order to either learn from or support that individual with respect to the areas above and that access to another therapist with more knowledge or skill was important to them in being able to provide treatment. Physiotherapy for clients after stroke may require the input of more than one person (Commissioning for Quality Innovation Stroke, 2012; ISWP: RCP 2012); the responses suggested that treatment content was influenced by the level of knowledge and skill of the lead therapist and all assisting persons. If all persons involved in the treatment had high levels of skill and experience a treatment of greater complexity could be offered. Respondents suggested that on occasions they acted as the skilled lead therapist and on

other occasions another therapist led the session in order to provide treatment at the required level and to develop the therapeutic skills of the therapist responding to the survey through guided and experiential learning. If skilled assistance was not available, then the treatment offered would be less complex.

Survey responses suggested that the number and skill of staffs providing an intervention reflected the need to ensure safety of clients, therapists and assistants during treatment sessions in order to support clients in the optimum posture for effective treatment. The need to work in specific positons in relation to gravity is supported by theory related to balance mechanisms (Shumway-Cook & Woollacott, 2011) and is supported by beliefs underpinning the Bobath concept (Raine, 2006; Raine, Meadows & Lynch Ellerington, 2009).

3.13 Physiotherapy post registration training and continuing professional development related to physiotherapy treatment of the hemiplegic upper limb after stroke

Government and professional standards require that physiotherapists engage with continuing professional development (Department of Health, 2004; The CSP, 2011). Research suggests that one of the influences on physiotherapists' clinical decisions is post - graduate training but that therapists are more likely to value courses aimed at improving their treatment skills (McGlynn & Cott, 2007). The list of courses which respondents were asked to select from was compiled by the researcher from those advertised in the Physiotherapy Journal and Synapse magazine. Although the primary objective of these was to develop clinical skills the scope of courses identified may also reflect one of the functions of the profession journal: to develop practice. This may have been unwittingly imported into the scope of the research questionnaire.

This limitation was compensated for in part by other areas of the questionnaire; a number of respondents had studied to masters (18.9%:

n=27) and doctoral (3.5%: n=5) level and indicated the value derived from this level of study. In addition to further practical courses identified (Saeboflex™ (dynamic splinting), constraint therapy), respondents also reported attendance on “neurological theory” courses and commented that reading of theory and research literature contributed to preparation for course attendance. Previous studies related to physiotherapists’ preference for experiential learning to support practice have not identified this aspect of interlinking of theory and practice learning (Iles & Davidson, 2006; Nisgärd & Lohse, 2010).

Respondents reported that attendance on a skills based course also involved the “interpretation and opportunity for peer discussion” of recent publications in relation to practice by the expert course leaders and that they considered this to be an appropriate and useful way of updating background research knowledge relevant for practice.

Physiotherapy is an action based profession and it is perhaps un-surprising that further education is directed at linking theory and physical aspects of practice. The limited access to funding and study leave for further physiotherapy education may also contribute to the requirement to demonstrate to budget holders that course content will be directly imported into practice development.

Further education in neurological physiotherapy is dominated by two paradigms (Davidson & Waters, 2000); neurological developmental techniques and functional practice and many post-graduate training courses are aligned with either the Bobath concept” or the Motor Relearning Process; this was demonstrated by the course uptake of the responding therapists. Courses addressing either the Bobath concept (n=91: 63%) or motor (re)learning (n= 34; 23.8%) accounted for the largest number of attendances reported. Data was not analysed to determine if individual respondents had adhered to a single paradigm.

The dominance of uptake of Bobath concept courses may reflect the availability of instruction; the infra-structure supporting this concept is International and has a strong base in Europe (International Bobath Tutors Association, 2014); a large number of courses are available and the progression is clearly defined, conversely the authors of the Motor Relearning Process are based in Australia and there appears to be a less defined pathway of alleged expertise.

3.13.1 Influence of attendance on a neurology based post- graduate course

Most respondents indicated that attendance on a postgraduate course had influenced treatment; this was slightly more apparent for selection of intervention than for delivery. Treatment selection is related to the needs of the client and delivery to the skills of the therapist (Shumway-Cook & Woollacott, 2007). The effect on selection may indicate that increasing knowledge about an intervention increases therapists' ability to evaluate its suitability for a specific client; an effect on delivery that an increased ability to execute the treatment increases the likelihood that they will use it.

It is interesting that the effect was slightly greater for selection than it was for delivery; the courses included in the list provided for respondents included treatments which are commonly covered in undergraduate programmes and with which they would be familiar; this suggests that although modest the influence of the course was on delivery rather than determining applicability which is consistent with work related to the areas of effect of post graduate masters study (Petty, Scholes & Ellis, 2011b).

The influence of post graduate courses on clinical decisions was supported by the number of respondents (n=109) who made additional comments, these suggested that the greatest areas of influence were to increase skill and range of practice which is in accord with existing research (McClynn & Cott, 2007) however respondents also indicated the value of courses attendance on application of research into practice. This demonstrates that although therapists value the increase in quality and range of treatment skills

subsequent to attendance of post graduate courses they also consider this to be in related to greater theoretical knowledge and understanding of the application of research. That is, both to an improved kinaesthetic ability within practice and to an increased ability to make theory: practice links.

3.13.2 Effect of attendance on a non-neurology based post- graduate course

Attendance on a non- neurological course was considered to have less direct effect on physiotherapy practice for clients with central nervous system dysfunction than attendance on neurological post graduate course. This appeared to relate to the content of the courses identified: greatest effect was attributed to “practice” based courses which included kinaesthetic components which are closely related to neurological theory and practice and therefore suggested that therapists found these areas of knowledge and skill easy to adapted and transfer to their own client group (musculo-skeletal practice, relief of pain, core stability, strapping, myofascial release, cognitive behavioural therapy). This suggests adaptability on the part of therapists and the need for a wide scope of knowledge from which to draw in addition to specialist skills.

A smaller number of respondents identified the value they had derived from attendance on courses related to communication (informed consent, capacity for decision making and equality and diversity) and the insight provided by managerial training courses (cost effective treatment, aspects of leadership) or those fostering effective multi-profession team working. This may reflect the seniority of the respondents and that they have responsibilities in both treatment and management.

3.13.3 Effect of published research read by respondent in the past 5 years

Responses suggested variation in the effect of published research on the selection and delivery of treatment. A third of respondents identified that their treatment selection (37.1%; n=53) and delivery (32.9%; n=47) had been

influenced by research findings but a further group reported the opposite; that it had been of little value to selection (16.1%) and on delivery (23.1%). This suggests that attendance on courses influences practice more than published research which is consistent with the findings of existing studies (McGlynn & Cott, 2007).

However, one of the valued components of postgraduate courses is the inclusion of recent research advances in both theory and practice. This was apparent from further responses; reading research contributed to personal development, preparation for or subsequent to courses attendance, in-service training and journal clubs.

Further, respondents identified the barriers to accessing individual RCT's afforded by time constraints consistent with Caldwell *et al*., (2007) and identified the value of expert peer reviews and summarised results included in Cochrane reviews and professional guidelines. This is in accord with the findings of Guyatt *et al*., (2000) which reviewed the behaviour of medical practitioners; the conclusion that despite increasing skills of appraisal and critical review it is difficult to keep up with the wealth of published material may be equally applicable to physiotherapists.

It was apparent from comments that therapists consider it important that their practice is based on a body of high quality clinically relevant evidence: areas which therapist used as examples which had affected practice were those for which there is considerable evidence: constraint induced movement therapy (n=18), Intense early rehabilitation (n=12), Task/function related practice (n=10), Mirror therapy(n=9), Bilateral upper limb tasks (n=7) and Splinting (n=7). This reflects research findings that in general that despite barriers afforded by time, appraisal skills and relevance of publications to practice physiotherapists have a positive attitude towards Evidence Based Practice (Jette Grover & Keck, 2003; Iles & Davidson, 2006).

It appears that the primary objective of physiotherapist's engagement with research is to directly support and develop practice although responding therapists consider many research projects to differ in key aspects from client groups encountered, treatment offered within the constraints of practice (Iles & Davidson, 2006; Nisgärd & Lohse, 2010).

3.14 To describe the type and frequency of occurrence of problems affecting motor control of the hemiplegic upper limb after stroke reported by participant physiotherapists

Studies suggest limited recovery of the hemiplegic arm in stroke patients. Up to 85% of patients show an initial deficit; figures regarding the degree to which this persists after six months vary depending on measurement scale but lie between 55% and 80% (Wade, 1992; Parker, Wade & Langton-Hewer, 1986; Warlow *et al*, 2008), this results from damage to neural tissue Levin, Kleim & Wolf (2008) and compensatory activity including altered features of arm movement, increased trunk recruitment (Roby- Brami *et al*., 2003) and fixation of specific body segments (Cirstea *et al*., 2003). Although specific problems are identified in literature the frequently of incidence is rarely mentioned. This will limit the extent to which results from this study can be compared to existing data.

3.14.1 Effect of stroke on the hemiplegic upper limb observed by Participants

The feature observed most commonly by respondents was "movement with altered pattern"; despite the number of respondents working in acute and early stage rehabilitation the majority identified "abnormal movement" rather than absence of movement as the most frequently observed feature of stroke on the hemiplegic upper limb. This is perhaps unsurprising, few individuals are left with a completely flaccid upper limb after stroke (indeed no statistics for incidence could be found) and altered movement would result from any of the more specific aspects which were also explored in the survey.

Respondents reported all of the features included in the questionnaire; alteration in range being recorded a little more frequently than reduced control. Further frequently noted effects of stroke were reduction in muscle activity which was reported to occur either often or more frequently by 75.6% of respondents. This area of impairment is thought to have a large effect on the functional loss secondary to stroke and a number of recent studies have investigated it in more depth. Results suggest that the observed weakness result from changes to the muscle structure (Teixera-Salmela *et al*., 1999; Moreland *et al*, 2003; Gray, Rice & Garland, 2012) and inadequate recruitment strategies (Gowland *et al*., 1992; Wade, 1992; Langhorne, Coupar & Pollock, 2009; Gray, Rice & Garland, 2012).

One of the most commonly acknowledged features of "upper motor neurone syndrome" is hypertonia/spasticity (Spasticity: Barnes, 2001; Turner-Stokes & Jackson, 2002; Sommerfeld *et al*., 2004; Welmer *et al*., 2006; disordered response of muscle to stretch: Knutson *et al*., 1997; Enoka, 2005). The two are not always differentiated in medical and physiotherapy texts but incidence of residual spasticity more than three months after stroke is recorded as 20% (Summerfeld *et al*., 2004; Welmer *et al*., 2006). Thirty-eight percent (n=55) of respondents reported observing increased tone either often or more frequently although this higher incidence may reflect the number of respondents who work with clients in the acute and early sub-acute stages of recovery.

Alterations in sensation were also commonly encountered by respondents: "always" was reported for reduced proprioception: 39.2% (n=56); reduced 41.3% (n=59); and altered sensation: 44.8% (n=64) and there is clearly overlap between these features; publications suggest high incidence of post stroke shoulder pain and this was in accord with respondents to this survey. Although only a small number (2.8% n=4) reported that clients' "always "experienced pain but 67.2% (n=96) of respondents reported either that this occurred "often" or "sometimes".

Subluxation of the glenohumeral joint is a common consequence of reduced muscle activity (Ryerson & Levit, 1997; Shumway-Cook & Wollacott, 2007). Published figures for incidence vary (17% Fitzgerald-Finch & Gibson, 1975; 66%; Smith *et al*., 1981). This is a broad array and it is perhaps unsurprising that the results of this survey fall within this range: shoulder subluxation was reported to occur often by 32.2% (n=46) and “sometimes” by a further 42.7% (n=61) of respondents.

3.15 Physiotherapy treatment options for the hemiplegic upper limb after stroke and identify the frequency of their use

3.15.1 Modalities employed by physiotherapists in treatment of the hemiplegic upper limb

One of the difficulties in determining the range of treatment included as part of physiotherapy for the upper limb is that detailed characteristics of the applied interventions are not reported in research documentation (Ashburn, Partridge & DeSouza, 1993; Sackley & Lincoln, 1996; Pomeroy & Tallis, 2000).

Interventions used are commonly base on three primary approaches to treatment; these include the Bobath concept (neurophysiological theory), the Motor Relearning Process which places greater emphasis on repeated practise and task related training (Chan, Chan & Au, 2006; Langhorne, Coupar & Pollock, 2009; Langhammer & Stangelle, 2011) and an “orthopaedic approach” (Chan, Chan & Au, 2006; Oujamaa *et al*., 2009; Langhammer & Stangelle, 2011) which includes addressing joint mobilization and limb strengthening. However, therapists rarely use one approach and practice may include a mixture of constituents; research to date has explored the effect and attempted to determine the efficacy of specific interventions but no data were available to describe the degree to which any specific intervention is used in physiotherapy practice for stroke.

No studies were found which provided details of frequency of use of specified interventions for the upper limb following stroke however work by Donaldson, Tallis & Pomeroy (2009) and De Wit *et al*. (2006) has gone some

way to defining potential content of physiotherapy input for the upper limb after stroke and this in combination with works which explore the content of intervention under the umbrella terms Bobath concept (Raine, 2006; Graham *et al*., 2009) and Motor Relearning Process" (Langhammer & Stangelle, 2011) may provide a background from which to discuss the findings of this study.

The results of this survey suggested that respondents were not overtly influenced by a dominating paradigm of neurological intervention although the key components of both approaches were used frequently. "Facilitatory handling" which is a component of the Bobath concept and not shared by the Motor Relearning Process was reported to comprise part of treatment either often or more frequently by three quarters of respondents. "Motor relearning" interventions were reported as being used less frequently within the "always" and "usually" categories but more often than facilitatory handling in the "often" category. In total 84.1 % reported using "motor relearning" either often or more frequently as an intervention although this should be interpreted with caution because it was not made clear to respondents if the survey considered this as a treatment "package "or as a descriptor of a component of motor recovery. Thus facets of facilitatory handling and motor relearning were reported by most therapists as part of regularly used treatment; this suggests that some respondents used both aspects as part of their treatment which supports the work of Davidson & Waters (2000) and Edwards *et al*., (2004) that therapists are not constrained by one paradigm. This may suggest that therapists prefer to select treatment in relation to individual clinical presentation or it may reflect the overlap of these two therapy approaches and their compatibility in having a similar neuroscience evidence base.

Respondents were asked to augment the list to include any modalities which had not been included; a small number of therapists additionally identified "Saeboflex" ™ splinting (n=6) and mirror box therapy (n=8) the additional suggestions were for therapies which are documented as part of Cochrane

reviews and professional guidelines and suggest that therapists have been influenced by published research and the need to demonstrate evidence based practice.

Note response to each part of the question varied and between 26 (18.2%) and 22 (15.4% of respondents did not provide this information.

3.16 Factors influencing clinical decisions

The factor identified by respondents as being the most likely to influence a clinical decision was “clinical experience”; both the median response 4 (a lot), and interquartile range 4-5 (completely- a lot) suggested that this was a powerful influence. Twenty-three per cent (N=33) suggested that this would influence their decision “completely” and a further 50% (n=70) that it would influence the decision “a lot”. This is in accord with existing research that decision making based on pattern recognition is developed through exposure to clinical situations (Case, Harrison & Roskell, 2000; Holdar, Wallin & Heiwe, 2013), and that this supports expert practice (Jensen *et al.*, 2007); the scope of the survey based phase of this study did not allow respondents to provide further explanation, this was explored in phase 2.

This factor was closely followed by “theoretical knowledge” which all respondents who answered this question reported as influencing their clinical decisions to some extent or more and almost a quarter reported as influencing them “completely”. This data was consistent with that for factors which overlap with theoretical knowledge; half of respondents reported that post graduate training influenced their decisions either completely or a lot and three quarters reported that in-service training would influence their decisions either completely or a lot.

Despite emphasis on the value of experiential aspects compared with published information (research, text-books, government and professional guidelines) a quarter of respondents reported that research published in journals would have “a lot” of influence on their decisions and a further

44.8% that published information would influence decisions “to some extent”, this reflects the findings of other studies that therapist accord value to research. However, researchers suggest that despite reporting that they value research the results are not overtly utilised in order to support daily clinical decisions (Metcalfe *et al* 2001; Bennet *et al*., 2003). Answers to previous questions in this survey suggest that rather than being viewed as an “independent” source of information physiotherapists may access and value research in association with post graduate courses, continuing professional development and in order to address the needs of specific client’s. This data may also indicate that the “current-ness” of the information is valuable to respondents because information published in textbooks was scored lower; 41.3% of respondents reported it would influence decisions “to some extent” but 26.6% reported it as “very little”.

Information gained from attendance at conferences had a varied influence, almost two thirds of respondents felt that this had some influence on their decisions but 17.5% reported the opposite, that this as very little. Respondents were not asked to indicate how frequently they had attended conferences; this data may therefore be based on expectation rather than experience.

Respondents reported that clinical decisions were least likely to be based on Government policy (a lot: 14%; to some extent 30.1%) or hospital protocols (a lot 11.9%; to some extent 28%; very little/none at all 37.8%) although this result may be misleading because government policy is embedded in service delivery and therefore informs hospital protocol and lower grade staff may not recognise its influence (Caldwell *et al.*, 2007) and is in accord with suggestions that therapists value their professional role and autonomy (McGlynn & Cott, 2007).

Respondents indication of the importance placed on the opinions and feedback from their clients’ suggest that patient centred treatment is important. Although only 5.6% of therapists reported that their intervention

would be influenced “completely” by patient feedback, 80% of all respondents to the survey (96% of those who answered this question) suggested that this would inform treatment either “to some extent” or more.

3.17 Conclusion

The responses to this study were collected by survey which limits the depth of analysis but the results are in accord with existing work. However, a discrete body of work has explored the context, influences and formulation of decisions made by physiotherapists (Jette *et al*., 2003; McGlynn & Cott, 2007; Jull & Moore, 2009). At present this is limited in scope and therefore not generalizable however initial interpretation suggests that the information which is used to inform clinical decisions reflects the complexity of clinical practice and the paradigm within which the therapist is working (McGlynn & Cott, 2007; Jull & Moore, 2009).

Thus there are personal, professional, academic, practical and managerial aspects to the role of the physiotherapist in clinical practice, all of which influence the type of decision being made and may go some way to explaining both why experiential learning is afforded greater weighting than published research and the way in which therapists interpret and embed research into practice. Phase 2 of this study attempts to fill this gap in knowledge about physiotherapy decision making by further exploring the rationale related to decisions made in practice.

3.18 Areas to be explored further in phase 2

The current understanding of physiotherapy practice for the stroke client group is limited and a number of researchers have identified areas where more information is required. Those areas which link with this study are summarised here.

Evidence suggests that the period of time during which the recovering central nervous system demonstrates most plasticity following stroke is three months (Albert & Kesselring, 2012) this may translate into different presentation and require different therapy goals. Further work is required to explore differences in physiotherapy practice for stroke at different points in the pathway (acute, sub-acute, long term) in more detail.

There is some evidence to show that more intense therapy can improve functional outcomes (Kwakkel, Kollen & Wagenaar, 1999; Langhorne & Pollock, 2002; Van Peppen *et al*., 2004; Langhorne, Coupar & Pollock, 2009) but this is limited. Further work should address how much therapy is required to be functionally effective, if there is a length of session which is most or least effective, to what extent these parameters are patient specific and if so are there reliable indicators which could be used to determine optimum therapy for an individual.

Results of this survey suggested that working with other individuals had a large effect on decisions which were made about treatment content and delivery; this would be worth investigating further, especially in view of exploring the breadth of the role of the physiotherapist, the value of MDT working and the balance of skill/grade mix which is necessary to deliver high quality service for this client group

Additionally, one of the difficulties in determining the range of treatment included as part of physiotherapy for the upper limb is that detailed characteristics of the applied interventions are not reported in research documentation (Ashburn, Partridge & DeSouza, 1993; Sackley & Lincoln, 1996; Pomeroy & Tallis, 2000). It is not uncommon for researchers to refer to interventions as “standard practice” or “enhanced practice “ without explanation of what is meant by these terms and although it is acknowledged that clinically relevant interventions may be complex and diverse which limits accurate description the need for more specific and accurate description of practice content to be employed in future research is considered imperative

(Marsden & Greenwood, 2005; De Wit *et al*., 2006; Donaldson, Tallis & Pomeroy, 2009).

Therefore, the findings from this survey have indicated several areas for in-depth exploration which are presented in phase 2.

CHAPTER 4: Phase 2: Semi structured interviews with Chartered Physiotherapists to explore influences on practice decisions about assessment and treatment of the hemiplegic upper limb after stroke.

4.1 Introduction

4.1.1 Summary of Phase 1 results

Existing work suggests that decisions made by physiotherapists about clinical interventions are influenced by personal, professional, academic and managerial considerations.

Findings from the survey in phase 1 were in accord with existing work that therapists reported decisions about clinical interventions were primarily influenced by clinical experience. However, the scope of research to document and interpret this area of practice is limited and there was little opportunity in phase 1 of this study for respondents to expand on their answers. Phase 2 will explore the way in which existing experiential knowledge is applied to decisions about assessment structure and treatment options.

The second most influential factor was theoretical knowledge; this included existing knowledge and that derived from postgraduate training courses. In addition to skills based learning respondents reported courses permitted peer discussion of theoretical knowledge and research outcomes and supported decisions about application of these to clinical practice. The second phase of this study attempts to add to this area by further exploration of rationale underpinning decisions made in neurological practice.

Findings from phase 1 indicated that structural features including the pathway of care (time after stroke) and service organisation may influence treatment selection and delivery. Phase 2 will explore decisions about physiotherapy practice at different times after stroke and will support exploration of these areas in greater detail.

Results of phase 1 suggested that working with other physiotherapists and other professions influenced decisions about treatment content and delivery but did not allow scope for description of the effect or the underpinning reasoning. This will be explored further in phase 2.

4.1.2. Defining physiotherapy practice

Researchers suggest that development of physiotherapy evidence base is restricted by lack of an agreed and accurate terminology to identify clinical interventions (Ceiza & Bickenbach, 2014; Djikers *et al*, 2014).

Extant studies described interventions used by therapists in neurological rehabilitation (Tyson & Selley, 2004, Donaldson, Tallis, & Pomeroy, 2009; Tyson *et al*., 2009) and classified interventions according to their anticipated effect in order to support investigation of specific aspects of efficacy (Gassaway *et al*., 2005; Fasoli & Chen, 2014; Hart *et al*, 2014 a & b). However, it is argued that developing taxonomy provides a simplistic and linear approach and that it must be contextualised in order to define, explore and inform practice. The process through which clinicians interpret and construct meaning from the information they collect may influence treatment selection. Therefore, in addition to accurate descriptors and identification of the "operational" component(s) of interventions it is imperative that the therapist's underlying rationale is also explored (Cott, Graham & Brunton, 2011; Whyte & Barrett, 2012; Cieza & Bickenbach, 2014; Whyte *et al*, 2014; Zanca & Dijkers, 2014).

However, work exploring specific features which therapists recognise and consider important is sparse. Davies & Howell (2012) demonstrated variation in physiotherapists' approach to collection, organisation and interpretation of information and suggested that evidence to support the accuracy or efficacy of any specific approach is lacking.

Phase 2 of this study attempts to fill this gap by initiating exploration of the rationale underpinning physiotherapists' clinical reasoning during the

assessment and treatment of the hemiplegic upper limb after stroke. In order to address the issues identified above interview questions explored the structure, content and process of the assessment and the process through which therapists related this to the selection, implementation and progression of their interventions.

4.1.3 Use of interviews to explore physiotherapists' clinical reasoning

Studies reviewed below used interviews or focus groups to explore clinical decisions made by physiotherapists. Client groups differ from the current study but researchers explored decisions about assessment and treatment selection/application and acknowledged interaction between the therapist and the client. This work has therefore been used to inform this study with regard to number of participants and method.

Seven physical therapists and three occupational therapists (OT's) working in acute care were interviewed by Jette, Grover & Keck (2003) to explore decisions made about discharge destination. The study employed an unstructured format with open ended questions based on the conclusions of previous literature. Participants were invited to review and edit the interview transcripts to ensure accuracy and interpretation. Areas which Jette, Grover & Keck (2003) acknowledged as limitations in their study were addressed in phase 2 of this study. Thus phase 2 participants were from one professional group, included male and female participants of a wide age range, who worked in a range of settings and across a wide geographical area.

Pashley *et al*., (2010) interviewed ten physical therapists and used a descriptive qualitative approach to identify and describe the factors therapists consider in clinical deliberations. Their objective was generation of a comprehensive summary of practices and events as they occur in everyday context. This exploratory study used open questions within individual semi-structured interviews (n=3), this information supported a focus group through which physiotherapists (n=7) described the clinical and contextual factors

informing decision making around discharge from orthopaedic physiotherapy outpatients.

Pashley *et al*., (2010) identified emerging categories and themes and demonstrated that such clinical decisions are part of a complex process requiring integration of a number of factors. Further, implementing client centred care into clinical practice is complicated and research should explore these findings in other settings.

A key feature between these studies is qualitative methodology employing semi-structured interviews and as such provides support for the method of the current study which has similar exploratory descriptive objectives in a different area of physiotherapy. In contrast to Pashley *et al*., (2010) the current study derived background information from answers to a specially designed questionnaire and used individual interviews rather than focus groups to extend this knowledge. This adaptation permitted inclusion of participants from wider geographical location.

A small number of studies explored clinical decision making in neurological physiotherapy. Findings are reviewed fully in Chapter 1 however areas where they support this study are described below.

McGlynn and Cott (2007) employed semi structured face-to-face interviews to explore processes supporting day-to-day clinical decisions in neurological physiotherapy. Participants (n=12) had a range of experience in neurological practice; Researchers used a prepared template of questions to support interviews during which participants described a typical treatment session including assessing the efficacy of a selected intervention.

In contrast, Tyson and DeSouza, (2003) employed focus groups (n=27; 6 focus groups) to explore process and rationale of experienced neurological physiotherapists during assessment of posture and balance. Participants were shown photographs of a “typical” stroke patient in sitting and standing and asked to discuss what they would note about this patient during

assessment, suggestions were recorded on a flip chart to support immediate feedback and discussion.

Phase 2 of the current study had similar objectives and the method employed was informed by aspects of these studies. For example, number of participants, recruitment from a group with experience in neurology, semi-structured interviews supported by a prepared template and based on reflection of actual practice decisions. Interviews for phase 2 were conducted by telephone rather than face-to-face which permitted access to therapist over a wider geographical area but precluded group discussion.

4.2 Aims and Objectives

4.2.1. Summary

This phase generated narrative qualitative data in response to open questions collected via a semi structured telephone interview. The interview explored therapist's experiences, thoughts and feelings during recalled interactions (assessment and treatment) with clients undertaken in order to identify and address movement dysfunction of the hemiplegic arm after stroke. Therapists worked in a range of settings including hospital based acute and rehabilitation services, community and private practice. Data collected is descriptive; compiling presentation of qualitative data derived from thematic analysis of participant narrative.

Themes were extracted from descriptions of therapeutic interaction via semi structured telephone interviews. These were examined in order to describe and explore the way that physiotherapists' organised the information derived during the interaction to formulate a personal understanding of the movement demonstrated by the client. Themes which emerged were categorised in order to explore how therapists ascribe meaning to their findings and use this to support their understanding of the problems associated with recovering motor control. Additionally, how this related this to

therapists' decisions about treatment options and modes of delivery for the hemiplegic upper limb after stroke.

4.2.2 Phase 2 aims

To explore the process through which therapists collect data about movement after stroke and the rationale underpinning their selection of treatment options.

4.2.3 Phase 2 Objectives

1. To describe the assessment process through which therapists collected information about movement of the hemiplegic arm after stroke.
2. To explore the rationale which therapists employed in order to identify and understand key components related to movement of the hemiplegic arm after stroke.
3. To explore the rationale which therapists employed in order to formulate decisions about treatment for the hemiplegic arm after stroke.

4.3 Method

4.3.1 Study design

Design: Descriptive Qualitative approach based on semi structured interviews; open questions and reflective discussion. This approach aims to understand the complexity of human experiences through exploration of personal aspects of the experience (Burns & Grove, 2009).

4.3.2 Overview

In this phase of the study telephone interviews were conducted to explore the content and rationale underpinning the examination and selection of interventions by participating physiotherapists for treatment of clients with movement problems of the hemiplegic upper limb after stroke. Interview questions were derived from literature review and responses to phase 1 of this study. Purposive, convenience sampling was used to recruit a sub group of ten physiotherapists from phase 1 participants who provided contact details in order to indicate their interest in participating in phase 2. Nine of the ten participants were in current practice with a stroke client base and one had retired from practice in the previous 12 months but had extensive experience treating clients after stroke; all were members of a post-graduate specialist interest group, The Association of Chartered Physiotherapists in Neurology (ACPIN).

This permitted access to a group of therapists who had relevant experience in the area of interest and facilitated the possibility of data saturation. However, a self-selected sub group may possess specific characteristics which are not shared by other neuro-therapists and the convenience may be offset by limitations in the range or type of data provided (Cresswell & Plano Clarke, 2011) (please see section 6.6).

Participants were drawn from senior NHS staff grades six (specialist physiotherapist), seven (highly specialist physiotherapist) and eight (Service Lead physiotherapist) and comparable roles in private practice and had a range of postgraduate experience in neurological rehabilitation for individuals who had sustained stroke. Participants worked with clients in the acute, sub-acute and chronic phases of stroke rehabilitation (definitions based on ISWP: RCP, 2012) although the practice of any therapist included clients at varying stages of recovery.

4.3.3 Interview schedule design

This study was explorative, interview questions were based on extant literature about factors related to clinical presentation and decisions about interventions during neurological physiotherapy practise for assessment and treatment of the hemiplegic upper limb after stroke. This process was based upon descriptions provided by previous studies (Edwards *et al*., 2004; Smart & Doody, 2007; Wallin *et al*., 2008; Quinn *et al*., 2009; Skjaerven, Kristoffersen & Gard, 2010; Haas *et al*., 2012; Kristensen, Borg & Houndsgaard, 2012).

Information was synthesised by the author from review of recently published research papers, medical and physiotherapeutic texts and National Institute for Health and Care Excellence (NICE, 2010) and Intercollegiate Stroke Working party: Royal College of Physicians (ISWP: RCP, 2012) guidelines for stroke in order to construct questions intended to explore participants' opinions of the process through which therapists collect data about movement after stroke and the rationale underpinning their selection of treatment options. This list was discussed with a senior (neurological) physiotherapist and a senior (neurological physiotherapy) academic prior to designing the interval protocol/schedule.

The draft interview protocol/schedule was piloted with two physiotherapists (one academic: one clinician) to check for face validity, to ascertain that the questions were understandable and un-ambiguous and to determine and refine timing. Modifications (in question sequence and wording) were made in response to their suggestions. Data collection via telephone interview/ digital recording was discussed with experienced research associates and the protocol refined further (simplified) based on their advice. Involvement of both academics and clinicians in review of the interview design and content ensured face and content validity and that the questions were relevant to the themes of the study.

The final schedule (see Appendix viii) comprised themes and suggested questions which represent the principal components of the interview:

1. Demographic and service based information: participants post-graduate clinical and educational experiences and influences, structure and clinical remit of participants working environment (staffing, Multi-professional team availability and working practice).
2. Reflective and belief driven information: participants' opinions and observations of the effect of stroke on the hemiplegic upper limb, the type of interventions which could be used during treatment and the factors which influence their decisions about selection of intervention.

4.3.4 Ethical approval

The physiotherapists who consented to take part in this phase of the study worked in both the private and public sector within the United Kingdom and participated in the study in their capacity as members of the Association of Physiotherapists in Neurology (ACPIN).

Ethical approval for this study was obtained from Northumbria University Research and Ethics Committee (28.11.11) and the Integrated Research Application System (City Road and Hampstead; Project number: 12/LO/0819: received 19.09.12) (Appendix ii).

All participants were given written and verbal information about the study and consent was gained before the start of each interview (Appendix ix).

4.3.5 Sample size

Sample size was limited by the use of purposive sampling from the participant group (n=143) involved in phase 1 of the study. Interview based

studies generate extensive material (Huberman & Miles, 2002; Alreck & Settle 2004, Saldana, 2009) and on discussion with research supervisors and associates it was anticipated that because the questions were about specific aspects of clinical practice it was acceptable to recruit a small group of participants (n=10) and to monitor the interview responses for “saturation” of emerging data. Review of similar studies supported the size of the participant group (Edwards *et al*., 2004, n=12; Smart & Doody 2007, n=7; Wallin *et al*., 2008, n=11; Quinn *et al*., 2009, n=9; Skjaerven, Kristoffersen & Gard, 2010, n=15; Haas *et al*., 2012, n=24 Kristensen, Borg & Houndsgaard, 2012, n=14).

4.3.6 Recruitment

Recruitment for phase 2 (n=10) was from participants (n=143) in phase 1 who had indicated their willingness to take part in a semi structured interview in order to expand on the information they had provided in response to the questionnaire. This selection bias of a subgroup from a specific group of physiotherapists working in neurology may have impacted on the range and transferability of the data collected (Edwards *et al*., 2004; Larsson & Gard, 2006; Plummer *et al*., 2006).

Potential participants were contacted by email and information about phase 2 (participant letter and information sheet – see Appendix) was provided. Potential participants were asked to contact the researcher by email or telephone if they were still interested and in order to arrange a convenient time for a telephone interview. Twelve potential participants were contacted and interviews were arranged with ten; it was not possible to coordinate a time with the remaining potential participants because of limitations imposed by their family or work.

Potential participants were assured that the time devoted to the interview was under their control; all participants were very generous with their time and interviews lasted between 30 and 60 minutes. Consent to record,

transcribe and analyse the interview data for themes was obtained by email prior to contacting participants by telephone at the time arranged, participants email replies were considered as tacit consent to participation, the researcher did not have mail addresses for participants; further verbal consent was given at the beginning of each telephone conversation. Participants were assured of anonymity and transcriptions were returned to each participant to edit, amend and expand further in order to ensure their discussion with the researcher was accurately represented and that they had conveyed the information which they wished.

4.3.7 Comparative terms for quantitative and qualitative research

If research findings are to contribute to practice the credibility and applicability of the findings must be demonstrable). Within quantitative research this equates to establishing validity of the measurements and accuracy and reliability of the data collected (Noble & Swift, 2015). Qualitative research aims to explore aspects of experience in comparison with qualitative work which aims to prove or refute association between variables (Cowan, 2009).

The soundness of the research establishes the veracity of the information provided and qualitative researchers should demonstrate the integrity of the final conclusions through detailed and accurate description of the appropriateness and application of the method employed to collect and analyse data. Long and Johnson (2000) suggest that within qualitative studies the integrity and precision through which the findings reflect the data demonstrates their ‘validity’ and that ‘reliability’ concerns the degree to which the analytical procedures are applied consistently.

Noble and Swift (2015) provides a table of comparative terminology and offers the following terms to describe similar constructs within quantitative and qualitative methodologies.

Quantitative methodology	Qualitative methodology
Validity	Truth Value (Veracity)
Reliability	Consistency
	Neutrality (Confirmability)
Generalisability	Applicability

Table 4.1: Comparative quantitative and qualitative terms (Based on: Noble & Swift, 2015)

4.3.8 Veracity of the questionnaire; applicability of the findings.

Questionnaire veracity was addressed by review of the draft version of the questionnaire by Chartered physiotherapists with clinical and academic experience relevant to physiotherapy practice in neurology. One academic and one clinical physiotherapist: both hold postgraduate Master of Science degrees in neurological physiotherapy and teaching qualifications. The schedule was amended in response to their comments.

Participants were recruited from a group with specific knowledge of the topic being investigated (experience in assessing the effect of stroke on movement and of selecting and delivering a physiotherapeutic intervention) working in in private and NHS services in England and Scotland and across the entire pathway of care (acute and long-term) for individuals following stroke. This was intended to reduce the possibility of geographic or exclusion bias and increase the likelihood of valid responses in relation to the subject and of those responses representing the range of clinical areas which constitute physiotherapy practice in treatment of stroke across the United Kingdom.

However, respondents were self-selected from a sub group of ACPIN members who had indicated their willingness to participate in providing research data and had participated in phase 1. This selection bias of a subgroup from a specific group of physiotherapists working in neurology may have impacted on the range and applicability of the data collected (Edwards *et al*., 2004; Larsson & Gard, 2006; Plummer *et al*., 2006).

4.3.9 Consistency (Neutrality)

Noble and Swift (2015) suggest that consistency and neutrality are demonstrated by the researcher through showing that decisions which were made are clear and transparent; that there is an “audit trail” relating to decisions about the structure of the research. Further that the complexity of engagement with participant and influences on the researcher philosophical position, experiences and perspectives are acknowledged. These areas are addressed in Chapter 2 as part of ‘factors influencing study design’, ‘reflexivity’ and discussion of ‘insider research’.

The interview schedule was specifically designed for the study and had three parts; questions in part one were semi-closed and extended the information already provided by participants in phase 1 of the study, questions comprising part two were open and explored participant’s physiotherapy background, beliefs about physiotherapy treatment choices and clinical practice. The third part of the interview comprised narrative within which participants were asked to reflect on and discuss their approach to assessment and treatment of the hemiplegic upper limb after stroke; this discourse was supported and illustrated by examples provided by the participant. Thus although the areas discussed were the same in each interview the content and format varied; this reduces consistency of the data collected because the “perspective” from which each respondent approached their reflection may have varied. Additionally, the contribution of the interviewer was difficult to standardise and may have unwittingly influenced participants’ responses and the direction of the discussion (Ritchie & Lewis, 2003; Alreck & Settle, 2004; Silverman, 2011). This was especially relevant because the use of telephone interviews prevented communication via body language and thus field notes were not employed.

Additionally, participants were aware of the prospective content of the discussion as this was provided in the consent material and thus had time to reflect in advance on their answers. Although physiotherapists are familiar

with case based discussion within practice and as part of Continuing Professional Development this is usually undertaken in a familiar environment and with colleagues. Information regarding the objectives and themes of the discussion was provided in advance in order to reassure potential participants that the method of data collection was “informal and non-threatening”. The wish to provide reassurance may have impacted on the interaction between the participant and the interviewer and influenced the direction of the narrative. Two of the participants were known to the interviewer and a third participant had attended the same university although not at the same time; this may have made discussion easier with these participants and/or may have influenced the narrative as they may have felt greater “pressure” to provide “right” responses. This was taken into account during analysis; no difference in the data provided by these participants in comparison with the others is apparent.

Finally, although all of the interviews were completed within a time frame of three months the interviewer increased in expertise during the data collection process and there are fewer “contributions” from the interviewer during later interviews; interview transcripts include the words of both participants and analysis (undertaken by the researcher) did not reveal differences in the data provided by later participants in comparison with the others. Transcripts were checked and amended by all participants prior to analysis which increases both veracity and consistency as participants were able to explain and expand on their comments (Appendix x).

4.4 Data collection procedures

4.4.1 Interview protocol

During telephone interviews the researcher was alone in a private room at the University of Northumbria; the telephone has an independent and private line and this was used on “loudspeaker” function. Interviews were recorded using a digital recording device placed adjacent to the stationary telephone receiver. Participants were in a variety of settings including work offices, physiotherapy departments and their own home. In each case the participant

was alone during the discussion. On two occasions patients arrived for treatment during the discussion; the interview was terminated and another appointment time to continue the interview was arranged.

Participants were aware of the overall aims of the interview (this was included in the participant information sheet) and the general areas of physiotherapy practice which might be discussed (information provided by email or telephone when arranging appointment time) but were not given specific questions to consider in advance of the interview. However, participants were assured prior to giving consent that the interview was informal and discursive and that although the researcher would “guide” the participant in order to ensure consistency in the areas discussed with all participants the content and depth of disclosure would be determined by the participant. Participants were also assured that there would not be discussion of areas which they felt uncomfortable about and that the final transcript would be provided for the participant to edit prior to thematic analysis. Participants were further assured that they could terminate the interview and withdraw their consent at any point.

In the first part of the interview participants were asked semi-closed questions which extended the material provided in the phase 1 questionnaire about their experience treating clients after stroke and their working practice. This included: more detail about their working practice (acute stroke, neurological-rehabilitation, community), specificity of client load (stroke specific or varied neurological case load including stroke), number of stroke patients usually seen.

In the second part of the interview participants were asked open questions about their physiotherapy background and influences on their beliefs about physiotherapy, treatment choices and clinical practice. This included: post graduate training or work in other areas of physiotherapy clinical practice, research papers, influences from associations with other therapists.

Participants were asked to reflect verbally and informally on their personal feelings about influences on their practice.

The third part of the interview comprised narrative within which participants asked to reflect on and discuss their approach to assessment and treatment of the hemiplegic upper limb after stroke; this discourse was supported and illustrated by examples drawn from spoken reflection by the participant (Appendix xi).

The researcher had an outline of areas to cover in the interview and “closed” questions were prepared in order to guide participants if necessary however the order and time spent on each part/stage of the interview varied between participants: some gave more detailed information than others. As the interview progressed participants became more relaxed and further relevant information was often shared.

4.4.2 Data transcription

In order to meet the time limit on this phase of the research it was considered useful to have assistance with transcribing the interview recordings. This was done by a Doctoral student from another faculty in Northumbria University; this individual does not have a medical background and has no connection with any local hospital, however but had previously worked to transcribe material for other heath related research projects (at Northumbria and other universities) and was aware of issues related to confidentiality. The participants for phase 2 were drawn from a national special interest group, thus were not known to the transcriber and were addressed by their first names only throughout the interview; although the size and structure of the service in which they worked was referred to there was no mention of a hospital or health provider by name; it would not have been possible for the transcriber to identify the participant from the information on the audiotape.

The researcher is also a member of the same specific interest group (ACPIN) and on a small number of occasions conversation after the interview (but still recorded; although the researcher did stop recording when it became evident that the interview was complete) included reference to persons who were known to both the researcher and the participants; these were national figures of importance in “neuro” physiotherapy specifically within teaching of the Bobath concept. For example, reference was made by one participant to working with Dr and Mrs Bobath in the early stages of her career and another participant referred to the expertise of a specific Bobath tutor who had taught on courses attended to by the participant. Information disclosed was appropriate as a continuum from the areas discussed during the interview and was already in the public arena.

The transcriber had limited knowledge of terms related to medicine (anatomy, physiology, pathology, pharmacy) and no knowledge of physiotherapy specific terms (kinæsiology, biomechanics, named physiotherapy intervention paradigms or physiotherapy processes). Consequently, some terms which were used by the researcher or participants to describe medical or rehabilitation treatment following stroke were unfamiliar to the transcriber and if the word could not be identified this was indicated by a solid line in the transcription. The researcher and the transcriber discussed such terms and the transcriber became increasingly familiar with common physiotherapy, medical and anatomical phrases for example; Bobath, Motor- relearning, “botox”, “saeboflex” as they were used by most of the participants. Prior to the familiarisation process the researcher located omitted terms on the audio tape and inserted these into the transcription.

Tapes were passed to the transcriber as soon as possible after the interview was completed (usually within 48 hours) and a transcription was available within less than a week. Transcriptions were given a code related to the day of the interview and referred to only by this code. Original audio versions of the data and the electronic versions of the transcriptions were held by the

researcher only and copies deleted by the transcriber as soon as they had been completed and returned to the researcher.

The initial transcription was returned to the participant by email in order to allow editing (Appendix x). This included expansion on areas of discussion which they felt required more explanation and removal of discussion areas which they felt did not represent their views or opinions accurately. This ensured that the final transcript represented not only the participants' words but also their intended meaning. Consent to use this material was thus further established. A number of participants provided extra background information on areas which had been discussed (this included a power-point presentation and a further supporting reference list).

4.4.3 Data analysis

4.4.3.1 Method

Researchers have referred to the "iterative "process of data collection and analysis (Lincoln & Guba, 1985) and suggested that analysis of data collected from one participant can inform or influence collection from each subsequent participant if the data collection and analysis processes overlap one another (Miles & Huberman, 1994; Silverman 2011).

Care was taken to limit this effect; interviews were scheduled within a short time frame from November 2011 to January 2012 and although the researcher engaged in reflection after each interview about her "technique" and the interview process no attempt was made to formally analyse the data collected until the process was completed. Each tape was checked for audibility and then sent in sequence to the transcriber. Time frame between interviews was short and the researcher was very engaged with the data collection and consequently became familiar with the themes which emerged during the interviews. Although no formal analysis was undertaken during this process the researcher was aware of the "re-occurrence" of areas during

discussion and prior to collecting data from all ten participants it was apparent that the information collected was reinforcing and confirming the content of earlier interviews and that saturation had been reached.

During the interview processes the researcher became more confident in interview technique and discussion and in acquiring information without "leading "or prompting the participant. Because of this the discussion during later interviews is more expansive and flowing than during earlier ones and information was given in response to fewer "questions" from the interviewer. Reflexivity is considered integral to qualitative research methodology; the researcher is not considered to be an external observer during the research process, the research and participants work together to build a shared construct during which data is created and collected. The imbalance between research experience and clinical experience of a researcher and as a clinician undertaking research my role as a fellow clinician may have provided an "insider" role which has potential to affect both data collection and data analysis (Cresswell & Plano Clark, 2011)

This researcher had no prior experience of the use of qualitative analysis, but has many years of experience as a physiotherapist working with clients who have had strokes. This has involved attendance on a number of postgraduate courses aimed at different aspects of neurological rehabilitation and completion of a master's degree; a number of the participants shared these characteristics. It is possible that my position as a "neuro-physiotherapy insider" may have created an understanding and empathy between participants and researcher and encouraged more honest and open discussion and disclosure than would have otherwise occurred. Additionally, several of the participants held masters/doctoral qualification and articulated their empathy in relation to data collection and their wish to assist in the research process; this increased my confidence about being a novice interviewer and allowed me to feel comfortable if I needed to repeat questions which had not been phrased clearly. This may also have improved

the specificity of the data collected. These issues are discussed as part of reflexivity in the relevant section.

However, this same background juxtaposed with lack of experience in coding and interpreting qualitative data had potential to cause “researcher bias” during analysis. I was concerned that my daily experience of making clinical decisions of the same type as those discussed with participants would affect my interpretation. In order to reduce this possibility a decision was made (after consulting relevant texts and discussion with peers who had experience with qualitative analysis) that I should follow the approach suggested by Lincoln & Guba (1985); and stay close to the words of the original texts in order to reduce the possibility of moving to “observer generated/ interpretive coding” too early in the iterative process (Sim & Wright, 2000; Denzin & Lincoln, 2005; Saldana, 2009).

4.4.3.2 Thematic analysis:

This was informed by Gamble (2013); Moule *et al*., (2011); Huberman and Miles (2002); Saldana (2009). The stages followed are outlined below:

4.4.3.2a Stage one: Familiarisation with the data:

A number of researchers (Huberman & Miles, 2002; Lincoln & Denzin, 2005) emphasized importance of gaining familiarity with interview contents prior to initiating analysis. Maykut & Morehouse (1994) argue that researchers should transcribe their own data, this reminds the researcher of the interview and re-familiarises them with the data. Maxwell (1992) additionally suggested that direct engagement with the data by the researcher limits the possibility of information being lost or unaccounted for. As explained the interviews were not transcribed by the researcher is was necessary to ensure that the familiarisation stage of data analysis was fully addressed.
All the interviews were read in their entirety several times; this was done while simultaneously listening to the tape of the interview. This ensured

familiarity with each participants “voice”, emphasis and phraseology (terms of expression) – this provided “immersion” for the researcher in the subjects covered in each individual tape and intimacy with the contents of the interview for each participant (Patton, 2002).

Each interview was summarised in order to provide a brief overview of the content which could be cross checked following thematic analysis to ensure that all aspects of the conversation had been covered. This ensured that the deconstructed interview used to allow detailed analysis and establish underpinning themes could be re-orientated to the context and “flavour” of the entire conversation.

4.4.3.2b Stage two: Unitising

This was based on the work of Miles and Huberman (1994) and Saldana (2009). Each interview was broken into “segments”, each of which represented a separate “idea” or subject; these were separated using tabulation and numbered.

Descriptive notes were made about each “segment” and recorded in the table beside that idea/subject; this was to ensure that the interpretation placed on the words used by each participant was as accurate as possible in relation to both their meaning and the context in which the word or phrase had been used.

4.4.3.2c Stage three: Coding

i. Identifying themes

After completing descriptive notes for all ten interviews the interviews were re-analysed and each description was used as a basis for formulating an overarching “theme” or codes; this was placed in a column alongside the original “descriptor” so that the “context” was still apparent. These themes were more formal and accurate than the original “descriptors”; a single

“descriptor” was sometimes used to generate several codes or more than one “descriptor” was considered to describe the same subject/idea/concept.

After “theme coding” each interview the existing and “emerging” themes were compared with the content of the other nine transcripts. Original comments were compared with the identified “themes”: matches were noted and this theme was added to the transcript; Non-matches were used to expand the list of themes and checked again against all other interview transcripts. Thus the content of each interview was cross matched against the content of the other nine interviews; this further increased researcher familiarity with interview content. Each theme was coded numerically.

ii. Identifying sub-themes

The process was repeated in order to be certain that the depth of analysis was adequate to “collect and code” all aspects of the data; by comparing the overarching themes and the “original phrase and subsequent descriptive comment” it was sometimes possible to separate each theme into more specific categories which were “truer” to the content of the original comment. Once again the researcher compared each interview with the existing themes and the “emerging” sub-themes; this involved cross matching the content of each interview against the findings from the other nine interviews. Final subthemes were established and coded numerically (Appendix xi).

Tables were constructed for each theme for each participant so that comparison between participants could be made easily across each theme and subtheme.

4.5 Results

4.5.1 Overview

Five themes were extracted from the data collected: these covered a range of influences on clinical decisions.

Theme 1: Beliefs about assessment
Theme 2: Influences on treatment
Theme 3: Perspectives during assessment/treatment
Theme 4: Holistic overview
Theme 5: Therapists view of their role

Themes varied in size. Theme 3 (perspectives during assessment/treatment) related to the identification of anatomical and physiological features of impairment and movement influencing decisions, although there was detailed content each subtheme was quite distinct and specific. Theme 2 (Influences on treatment) identified issues about service structure and professional issues around informed consent and goal setting.
Broader themes which revealed wider issues about assessment underpinning clinical decision making were theme 1 (beliefs about assessment), theme 4 (holistic overview) and theme 5 (therapists view of their role).

4.5.2 Participants

Relevant participant characteristics are detailed in Table 4.2 below, pseudonyms have been used in order to protect participants' identity and these will be used during presentation of results and discussion.
Participants had a minimum of 5 years working in neurological physiotherapy, the maximum was 40 years. All had experience of physiotherapy during acute and rehabilitation phases following stroke.
Post graduate training which may have influenced treatment decisions is detailed in Table 4.3

Pseudonym	Grade (Years)	Physiotherapy and academic qualifications	Area of work
Emily	7 (5-10)	BSc (Hons) Post registration MSc	In patient Neuro-rehab unit
John	6 (5-10)	BSc (Hons) physiotherapy PhD	Outpatients/community team
Mary	Just retired (40)	Diploma in physiotherapy	Community
Rob	7 (10-15)	BSc (Hons) physiotherapy	Neurology outpatients
Sue	6 rot (10-15)	BSc (Hons) physiotherapy Post registration MSc	Community stroke team
Meg	7 (5-10)	BSc (Hons) physiotherapy	Community stroke team
Alan	7 (30-35)	Diploma physiotherapy	Private practice
Peter	8 (25-30)	Diploma physiotherapy Post registration MSc	Acute services inpatients /outpatients
Alice	7 (10-15)	BSc (Hons) physiotherapy	Acute services inpatients
David	7 (15-20)	PhD BSc (Hons) physiotherapy	Community stroke team

Table 4.2 Participant characteristics

Pseudonym	Post graduate physiotherapy training
Emily	Weekend Bobath courses
John	Weekend Bobath courses Fascial release course
Mary	Basic (3 week) Bobath course Fascial release course
Rob	Weekend Bobath courses Motor learning based on ‘Skill acquisition’
Sue	Weekend Bobath courses Basic (3 week) Bobath course Advanced Bobath course
Meg	Basic (3 week Bobath) concept course
Alan	Advanced Bobath concept courses Psychology qualification
Peter	Weekend Bobath courses Basic (3 week) Bobath course Advanced Bobath course
Alice	Weekend Bobath concept courses
David	None stated

Table 4.3 Participant’s areas of post graduate training

4.5.3 Themes extracted

Themes and subthemes will be identified and discussed in relation to characteristics of participants and the thoughts and feelings articulated by the individual participants. Supporting quotes retain the meaning of the original wording but pauses and repeated words have been removed in order to increase clarity. Line numbers are reported; forward slash indicates separate lines; hyphens indicate that all lines within those parameters are included. Five themes were derived from the participants' narrative; these are reported below.

4.5.3.1 Theme 1: Beliefs about assessment

Subthemes:

a. Assessment relates to the entire person
b. Assessment is an ongoing process
c. Assessment is contextual

4.5.3.1a Assessment relates to the entire person

Participants reported collection of information regarding specific effects of stroke on the arm and other areas of the body. There was accord over areas generally assessed, these included overall limb alignment at rest and during movement, sensation, muscle activity (tone and strength), joint range (a summary of assessment content described by participants is presented in Appendix xii).

> "Range of movement, strength in arms and legs, anything that's limiting joints or length of muscle or positioning" (Emily: 36)

However, participants explained that more detailed investigation of specific areas of movement was based on presentation. For example, more information about precise movement of the arm would only be useful if the client had global control of the trunk and proximal arm and would therefore only be tested if movement of these areas were present.

> "If they've got reasonable activity, and only if they've got reasonable activity, I would look at coordination and strength testing to get some quantitative value for how and where their activity is" (Alice: 49-51).

Therapists measured separate components of upper limb movement and evaluated these as part of the movement and interaction in relation to movement of the body as a whole. Two participants made this point very explicitly:

> "I rarely treat an upper limb as an upper limb. It's part of a human being, you know what I mean? So it's unusual for me to look at an arm in isolation" (Alice: 35).

> "I see the arm very much as part of the body. I'm looking at the patient as they are as a whole" (Alan: 12).

This objective was achieved through observation of the relative positions of the arm and the body during unconscious (demonstrated for example when changing position or talking) and volitional movement.

> "Assessment of the whole person, starting from assessment of sitting balance and postural control in terms of how they carry the arm. It is important to assess in the environment and to consider their mobility in general, how active they are" (Sue: 6/17/18/19).

Participants considered the effect of body position and environment on control of arm movement. This was examined in different postures (sitting, standing, lying) and included overall body position on different sizes of supporting surfaces to explore the effect of gravity and balance requirements on clients' movement. The information thus collected informed decisions about further assessment so that assessment was structured and adapted to determine the movement control of each individual client.

> "If they haven't got sitting balance, I'll have to take them out of that posture because that might be too difficult for them and then they can't activate their upper limb…. If I don't feel they're stable enough to work on their arm in standing, then I'll take them into a more supportive posture" (Meg: 60/65).

> “I think if you’re looking at someone in bed you’re going to get a different opinion to if you’re in sitting, and especially walking (Emily: 143/148).

Participants discussed the importance on movement of a client’s awareness of their own body and of their surroundings. This was considered an important component of movement and an indicator of rehabilitation potential.

> “I want to know if the client is communicating effectively, some idea of cognition is vital. How engaged they are and how easily fatigued then I can find out other things later midline, neglect and engagement” (David: 6/8).

> “Sometimes patients haven’t got the cognition for your treatment sessions to be as effective as you would like them to be. Active participation plays such a key role” (Meg: 167/170).

Discussion of this area related primarily to “severe” presentation of “neglect” as a recognised medical term but participants who worked in the less acute sector also agreed that treatment goals required the client to have insight and engagement.

> “Some people will be much more inquiring about “Why doesn’t my arm work?” for want of a better phrase. Some people will be much less” (Peter: 60).

Thus information was collected about different levels and aspects of movement control of the arm and analysed in relation to body posture and interaction with the environment.

4.5.3.1b Assessment is a fluid process; assessment and treatment are interlinked

Assessment was not conducted over a single session; participants explained that clients’ movement was affected by different circumstances, for example as a consequence of fatigue or body position. Therapists based assessment on the way that the client moved over several sessions.

> “Initially, you don't know the patient, and you don't know how well they’re going to respond to therapy” (Alice: 105).

Participants agreed that assessment was structured but not standardised. This was because presentation differed between individuals the assessment needed to be flexible in order to collect relevant information across a spectrum. Examination was used not just to record a baseline but to support therapists understanding of the basis for the client’s movement.

> “Working systematically, but flexibly about where you start your assessment, how your assessment flows in terms of the different things that you might test. You, can be more adaptable in that, more responsive to the patient and what they present with rather than sticking to a structure” (Peter: 154).

> “My intention is to get a good overview of what works and what doesn’t work. If find something which is not working well or appears to be a problem I go back and approach assessment from a slightly different angle” (David: 7-9).

Therapists working within a multi-disciplinary team provided information about movement for other profession and this might be performed independently of physiotherapy specific assessment.

> “I assess gait and transfers when they’ve just come in and the nurses need to know. I’ll have a little feel of their hand and a little look and a question about pain and later on I’ll look at it further” (Emily: 131/132).

The reported structure of assessment varied. Some participants started with examination to determined levels of specific impairment; this was slightly more likely in the acute sector where clients’ had less recovery of function. Others conducted assessment through exploration of client’s movement in relation to everyday activities.

> “I do tend to be quite logical and I feel that I probably always will look at their tone, their passive range, the activity they’ve got” (Alice: 100).

> “I would talk about functional use. Are they using their arm? Is there any movement back? What functional activities did they struggle with?” (John: 85/87).

Although the implication was that flexibility was advantageous to the assessment process one experienced therapist explained the need for care that having a less structured approach did not limit the information collected or affect the interpretation of this material.

> "Pattern recognition may get you down that route of hypothesis generation quicker; it helps you miss out stages. You still have to gather the information and make sense of that and generate your hypothesis but, you have to be aware that it's possible to miss some things doing that" (Peter: 151/152/155).

A less experienced participant implied that the problems could be identified from the outset of the interaction and prior to detailed assessment, which suggested that this was indeed an area where care should be taken.

> "You take one look at the patient and how they're sitting and where their limbs are and you know what you're going to find anyway" (Rob: 179).

For some therapists, assessment also included undertaking "shared" movements during which the therapist and the patient worked on an action together (this was termed "facilitation and is defined in the glossary). This interaction was used by those therapists as a basis for decisions about movement pathology and treatment potential.

> "Facilitate to give them the feeling of movement and try and give them as much sensory stimulation as possible. If it's a very early, low-toned, heavy arm, they you might see their thorax become a little bit de-weighted" (Meg: 34/35, 80).

The degree of differentiation between assessment and treatment varied, in the example above the therapist described a response from the trunk when she assisted the client to move their arm. This suggested belief that a client's motor control might change as a result of "assessment". This is endorsed by another participant who suggests that assessment and treatment are not separate processes.

> "Assessment and treatment would be very inter-linked. They would be happening concurrently and interacting all the way through" (Peter: 81).

> “I’ve found that thought process and problem lists develop as you go along” (Sue: 222).

Others took a more linear approach; one participant describes analysing information and thinking about possible treatment as part of the assessment and another is very structured in establishing relationships between impairment and function although the assessment could be undertaken from either direction.

> “Doing the assessment, you’re building a potential treatment plan, in your head as you’re going along, picking up priorities as you go” (Rob: 118).

> “I make a list of impairments and a list of functions. What is and isn’t working as they would like it to. I could just as easily have gone from functional tasks to impairment” (David 35/36).

Thus for many participants the process of assessment influenced the client’s movement control and they “updated” their baseline and altered their input accordingly. For others this process was less immediate although a direct link was perceived between assessment findings and proposed intervention

> “I don't think I’m prescriptive with my treatments. I’m led by what I find on assessment and how much activity they’ve got “(Alice: 159).

> “I will change my handling during the treatment session, depending on what I’m feeling, and seeing, to see if I can get a better outcome if I change my position, the patient’s position or my handling” (Sue: 307).

4.5.3.1c Assessment is contextual

Participants agreed that decisions about treatment were contextualised by knowledge of the client’s movement prior to stroke, the time since the stroke and response to treatment from the onset of the stroke. This information supported therapists’ determination of clients’ possible level of recovery, prioritisation of movement difficulties and selection of intervention.

> “When I’m assessing I’m also very aware of any pre-morbid factors” (Alice: 61).

> “It can be easier to understand later presentation if you have a list of initial impairments. You can consider the layers of what is going on, what is getting in the way. The less obvious layers underneath may be limiting factors (David: 37/39).

> “I would take into consideration their overall recovery from their strokes, the severity of the stroke and how much movement has come back to gain a feeling of their level of potential” (John: 52/ 53).

Only one participant overtly mentioned the implications of the size and position of the lesion on the presentation and potential for recovery; this individual had a background in pure science prior to training in physiotherapy and throughout our discussion included aspects which were more precise and measured than other participants. These were integrated into the way this individual approached his role and provided the basis for ongoing training and personal challenge to encourage greater assimilation between scientific and evidence based aspects of practice and the delivery of interventions including “hands on” treatments.

> “Also I consider LACI strokes often make more progress and have more rehab potential, so be aware of CT results” (David: 31).

In association with time since stroke participants’ based prediction for recovery of upper limb function on the amount and specificity of clients’ movement control, especially degree of volitional hand movement.

> “A good sign is an arm that’s looking like it’s got some activity in it, and they’ve got an active wrist and maybe some finger activity” (Alice: 118)

> “If the hand has activity in it at all or alternatively very little, none below the elbow or how far down the line of recovery are we? Is it more than 3 months down the line? If we are not going to get functional activity, we may then have to restrict ourselves to limiting pain and washing and dressing and range of movement” (David: 21/23).

Therapists felt that their assessment was limited if the patient presented with profoundly altered muscle activity. This was expressed as a “continuum” between very low and very high activity and was linked with the belief that

altered muscle activity at either “end” of the “spectrum” limited therapy options and required care to prevent pain and damage to joints.

> “I always find it difficult when tone just keeps going up and it doesn't seem to respond to anything. My strategies for dealing with that are fairly limited to educating the staff about correct positioning” (Rob: 86-88).

> “If low toned do I need to provide them with a sling? If there was increased tone, I would get our consultant to have a look at them regarding Botox” (Emily: 34/35).

The “middle ground” provided the therapist with the largest number of options for assessment and treatment and the client with the greatest possibility of regaining functional upper limb movement.

> “If they have got some activity I’ll relate it to function where I can and that’s easier for higher level patients, who’ve got some nice activity and maybe you’re just working on hand control and co-ordination” (Meg: 37/38).

There was some discrepancy in terminology used to describe non-volitional muscle activity. Most participants referred to this as high or low “tone”. There was more accord with the expression “high” tone and low tone was interchangeable for some with the word “weakness”. One participant expressed this very clearly.

> “I prefer to use the expression weakness rather than low tone. The cause of the problem is lack of strength and lack of signal getting down from the brain. High tone is a secondary symptom that reflects lack of motor cortex activity” (David: 17/18/10)

Thus, results suggested that although the assessment process collected similar types of information the structure differed slightly between individual physiotherapists and different clients. This permitted detailed evaluation of relevant areas and physiotherapists’ perceived that this related to client presentation, the context of the assessment including past medical history, time since stroke and specific features including pain and level of recovery.

4.5.3.2 Theme 2: Influences on treatment

Subthemes

a. Structure of service
b. Evidence based practice
c. Therapists background knowledge

4.5.3.2a Structure of service

Participants worked within a range of services providing treatment for clients in acute and long term recovery after stroke. Responses suggested that decisions were influenced by service structure with regard to care pathway, staffing and skill mix.

In early recovery one therapist suggested that shorter sessions were desirable and that MDT therapy was necessary to address problems requiring combined skills (for example swallowing difficulty is alluded to in the example below). This reduced the energy demand for the client in the acute recovery period of stroke.

> "Acute patients fatigue fast and may need a ten-minute session working with SaLT and physio together, then I would come back later in the day. Patients are in a psychological state of stress, and emotional shock. They are also tired by constant interruption and being disturbed for medical investigations and afraid of being in hospital" (David: 28/40/41).

In contrast within the community participants identified client tolerance for longer periods of treatment time but concern that staffing levels impacted on this provision. A senior therapist working in the community explained that she could only offer treatment for periods of six weeks and that her high caseload limited input. However, another participant worked in an acute unit, there was less service pressure and more treatment could be offered if required.

> "The maximum I can give to people is two visits a week, in terms of my caseload, which is between 25 and 30 people" (Sue: 98/105).

> “They’re with us for longer and there’s no pressure to get them out, we have 12 weeks, usually, minimum” (Emily: 99).

Treatment decisions in the early stages were determined by assessment findings, decisions in later stages of recovery were influenced to some degree by treatments established by previous therapists.

> “I work with the community team; patients are handed over to me from an acute or rehabilitation hospital. So some client’s already have some type of intervention. A splint or an exercise programme for their upper limb with some management in situ” (Sue: 32-35).

Additionally, there seemed to more “pragmatic” approach once the initial phase was completed. Therapists acknowledged work on function based on abnormal movement but still emphasised that adverse secondary effects should be avoided or limited.

> “If they’re a bit more chronic, then I’m a bit more “gung-ho” about it” (Alice: 209).

> “If further recovery is not realistic, we could teach a strategy in which the arm could be used functionally but which doesn't result in the arm ultimately becoming less functional because of the secondary effects of that” (Peter: 47).

Working with another physiotherapist was considered desirable and supported treatment decisions through increasing physical capacity and making more difficult interventions possible. The skill of the assistance was considered important and joint treatment was enhanced by the opportunity to share information, discuss objectives and reflect.

> “I like to treat all my really bad upper limbs with another experienced therapist. So that I can get them to facilitate and give some trunk or shoulder stability while I’ve got my hands on” (Alice: 304/305)

> “In the acute sector I was very lucky working with a good bunch of people. This provides another pair of hands and we talk to each other and get a different perspective on what they are doing and what the patient is doing” (David: 43).

> "When you're not working with colleagues, I'm wary that I'm going to get stuck in my ways. I need to sit down and reflect on what I am doing. Why am I doing that? What is the evidence? It's difficult not having colleagues to do it with" (Rob: 203/204).

Acute services in particular provided the opportunity to work as part of an MDT and physiotherapy input delivered in association with other therapies was considered important in achieving function. Participants mostly identified working with Occupational therapists on overall function and with regard to hand activities.

> "I work a lot with OTs, we work together and get someone standing to do kitchen work and use the arm to reach" (Emily: 174).

4.5.3.2b Evidence based practice

All participants spontaneously discussed research evidence which influenced their decisions. This related to five areas of practice; constraint therapy, passive stretch, unilateral and bilateral upper limb movements, repeated functionally relevant practice and the Bobath concept.

Despite awareness of supporting evidence participants described rejecting or modifying an intervention in relation to individual clients'. For example, participants described evaluating the value of constraint therapy with respect to client and service characteristics prior to including it in treatment.

> "Unless they are motivated and doing it with just the programme handed over to them then they are very limited in relation to constraint therapy. We are struggling, in providing the time to offer the frequency of task specific practice (Sue: 87/95)

> "Stuff goes through my mind, though I actually find that I very rarely have patients with whom you can set up a decent constraint therapy programme. It's few and far between that they have got enough movement, plus the cognition and the motivation to do it" (Alice: 120).

Therapists working in NHS out patients all discussed the possibility of using or modifying constraint as part of therapy, another therapist who worked in private practice was aware of the value of this intervention but was much

less directive in discussing it with clients. This participant also reported awareness of research about strengthening exercises but reported that this was something that he rarely included.

> "I would explain that there's treatment philosophy based on constraint therapy and that it might be worth constraining themselves a bit in order to get a better result. I would suggest that they experiment" (Alan3: 96).

In contrast although participants agreed that evidence does not support the efficacy of passive stretch they described individual interpretations of this modality. One participant who is very research aware reported that this intervention was a "waste of time".

> "I rarely do stretch and manipulation looking at the evidence on manual passive stretch in the NICE Guidelines. It's very hard not to but data suggests that it makes no difference" (David: 49).

Another, who also holds a higher degree, was less emphatic; she acknowledged lack of research support but expressed her belief that she employed passive movement for a different reason.

> "I'm aware that me doing passive range to that arm once a day is of limited benefit. I would probably do it anyway, but what I'm thinking about and looking at is have we got some activity?" (Alice: 134-136).

Several participants used bilateral arm movements in treatment although the rationale supporting inclusion of this modality was very different. This included explicit consideration of the effects of unilateral or bilateral upper limb activities on specific aspects of motor control. Another participant used movement of the non-affected arm to provide sensory experience of function based motor pattern for an underactive hemiplegic arm.

> "There is research about bilateral upper limb exercise. I might focus on rolling the ball to develop stability within the trunk, bringing in the thoracic spine which can be stiff then into unilateral movements to develop independently moving the arm" (John: 256- 262).

> "Bilateral arm activity, using a double-chambered hand splint. We'll do activities reaching out to touch targets. Clinical reasoning is using the movement pattern of the unaffected arm to guide the movement pattern of the hemiplegic side" (Rob: 98/100).

All participants reported using functionally relevant repeated practice. This was considered so important that two participants used dynamic splinting to maintain position of key joints so that the client could practice.

> "A saebo flex; it's like a dynamic splint and it overlaps OT and physio, it's to do with repetition and task-orientated function of the upper limb" (Emily: 55)

However, another participant was strongly opposed to this practice and explained that this modality was not compatible with his understanding of motor control and contradicted his treatment philosophy.

> "So, for me, it's different to my understanding of the neuro-science literature around the most powerful way to promote movement recovery. Not just strategy to do something, but genuine movement recovery about what sensory information do we enable the patient to access and practising in action" (Peter: 184/185).

Responses of therapists who participated in this phase of the study indicated both awareness of evidence and confidence in critical appraisal with respect to its application. Although it should be noted that half of the group held higher degrees. The excerpt below also demonstrates the underpinning philosophy of this participant about the practice of physiotherapy.

> "There is evidence for constraint, but (I) subject EBP to personal understanding and consideration of the patient as an individual. evidence-based medicine is great and we should be influenced by evidence, but in the end there is art left in physiotherapy, it's not a pure science yet" (Alice: 124/126/245).

Research awareness was not just in relation to specific treatments, another participant who has a higher degree and experience of applying the Bobath concept to current practice explained how research about neuroscience informed his practice decisions.

> "One example would be a recent paper about adaptation of learning; it was about how the nervous system corrects errors. There's a lot of emerging evidence around the whole idea of internal models for motor control, which is much more efficient than waiting for sensory information" (Peter: 191).

Although research evidence was cited as an influence this emerged through discussion about assessment and treatment. Participants did not specifically refer to use of Cochrane reviews, NICE or RCP guidelines in order to inform their practice decisions.

4.5.3.2c Therapists' background knowledge

Participants discussed a range of treatments. Suggestions to address bio-mechanical aspects of movement (for example joint range, muscle strength and endurance) included massage, stretching and active exercises.

> "I might include active assisted arm movements, hand massage and stretching" (John: 235).
>
> "We've got standard things like exercises, general activities and range of motion type things" (Emily: 61-63).

There was some difference of opinion with regard to strengthening, some participants used resistance through client's own body weight, and others described the use of overload principles with external weights.

> "Wall-based press ups or using the gym ball for resistance training in standing, pushing the ball against the wall perhaps doing circles with it" (John: 217/ 218).
>
> "If they are able to move the arm against gravity through the functional active range of movement I will set strengthening exercises using gradual overloading (1-3 sets of 8-10 repetitions). Or I utilise weight-bearing using their bodyweight, so four-point kneeling or propping up on the arm" (Sue: 142-145).

This was an area where there was variation; one therapist (above) described use of general muscle strengthening principles, another (below) reported that she felt care was necessary about factors including the clients' position during exercise and the potential effect of strengthening work on resting muscle activity (muscle tone).

> "It's on a background of a position where you can elicit good activity. I'm getting better at strengthening very early after stroke, if they've got activity you can strengthen, I think we probably should be doing it. Because if they've got that much activity, I don't think they're going to develop too much high tone" (Emily: 204-211)

Treatment of neurological aspects of movement control was addressed by eliciting muscle activation in sequences (patterns) which were considered indicative of normal movement. This was addressed by some participants through facilitatory handling and increasing sensory integration providing feedforward and feedback information and by others through utilising principles of motor learning and skill acquisition by progressively increasing the difficulty of a motor task.

> "Simple weight-bearing through that limb in pushing, against me, so they're getting an extension pattern of movement" (Rob: 89).

> "We were able to facilitate shoulder and trunk activity by guiding movement through her elbow. Instead of fixing her trunk into flexion whenever we tried to cue movement she was responding positively to being handled" (Mary: 61)

Many participants treated arm and hand movements involved in reaching and grasping through the use of familiar objects particularly those associated with eating, drinking and grooming. However, novel ways of achieving reaching were also included.

> "Just using a cloth and moving the hand to wipe the table. I'll put targets on the table in front of them, letters and numbers. And just shout out random letters and numbers as they go and search for them, and then reach and point to them" (Rob: 152)

Participants provided theoretical background for the interventions discussed however the paradigm mentioned most was by name was the Bobath concept. All therapists in this study had awareness from undergraduate teaching or postgraduate courses, three had attended advanced Bobath concept courses and several had attended weekend teaching.

> "I was very receptive to what therapists were doing with this Bobath approach, which sounded sophisticated and three-dimensional. I was very lucky that within 18 months of qualifying I did a Bobath course. So that's been a huge influence" (Alan1: 63/ 65.)

Opinions expressed were mixed; criticism was offered regarding the teaching methods, lack of robust supporting research and limited applicability within current service constraints. Despite this, participants found courses informative and one suggested that recent inclusion of EBP about function increased Bobath concept relevance to practice and thus more likely to inform clinical decisions.

> "The Bobath type stuff, I tend to use only small elements of that and have it task-orientated. I know Bobath are going more towards that anyway. I do use the weight bearing through the limb and the reaching" (Emily: 160/163).

One participant was very critical regarding the lack of evidence base and cited the importance of published material to his practice decisions, for example that supporting of the value of early and intensive therapy.

> "Horne (2005) analysed treatment with early aggressive high level therapy. Go for the highest possible task that the patient can achieve and this will produce effects. This is called the "trickle-down effect" by occupational therapists and is an accepted approach" (David: 29).

Other participants valued the underpinning neurological theory provided as part of Bobath concept teaching and identified that practical skills from courses influenced their day to day practice. This was supported with discussion of features of normal movement for example why increasing sensation is a component of treatment.

> "Enable the person to access more varied, richer relevant sensory information. This improves movement control because one of the effects of neurological impairments is that it constrains movement choices and movement varieties. Sensory information about your body is diminished therefore your nervous system has less information on which to learn (Peter: 193/194).

Another participant explained how he based his treatment on a theoretical amalgamation between the effect of the Bobath approach on creating

neuroplastic change and knowledge of “skill acquisition” on building task complexity.

> “My understanding of combining skill acquisition with neuro-plasticity is that it needs to be task-specific but that we’ve got destruction of the pathways so they don't have the normal movement available to them. I don't take a scattergun approach to rehabilitation, it’s structured around set principles” (Rob: 30-33).

All participants utilised functional activity as part of treatment and all felt that this was desirable within their theoretical paradigm and understanding of motor control.

> “I think change in the brain happens in terms of the task. The reach needs to be meaningful and then that process happens in the brain. Then I think we’ve got probably more chance of laying on the changes” (Sue: 220-222).

Participants employed specific techniques to treat altered joint alignment and release soft tissue; that mentioned most specifically was “myofascial release”, although other mobilisation techniques derived from neurological and musculoskeletal practice were also mentioned.

> “I’ve been on some recent MSK courses so myofascial release and joint mobilisations and stretching” (John: 229).

> “Joint compressions into their fingers or wrists, mobilising the hand if it’s tight, and increasing muscle length” (Meg: 114).

Thus participants reported a range of influences on decisions about interventions. These included the positon on the pathway of care, the number, profession and skill of staff available and specific areas of therapists’ understanding in relation to theoretical background and application of research evidence.

4.5.3.3 Theme 3: Perspectives during assessment/treatment

Subthemes

a. Client's postural control and interaction between gravity/base of support
b. Specific aspects of motor control
c. Specific indications supporting decisions about initiating or progressing treatment
d. Functional movement

Participant therapists provided detailed comments about the way that information was amalgamated and interpreted in order to support decisions. These themes are derived from the participants' explanations related to the context.

4.5.3.3a Client's postural control and interaction between gravity/base of support

Participant's considered interaction between body posture and arm movement during assessment and treatment. This was related to belief that arm movement is influenced by the position of other parts of the body, especially the trunk. This was described in relation to the biomechanical link through the arm, trunk and pelvis to the supporting surface in sitting and including the lower limb in standing.

> "My reasoning is that if they haven't got the stability in sitting, that's not going to give them a stable basis on which to selectively activate their arm" (Meg: 61).

> "Do I need to improve their trunk first, and look at their scapular stability and scapula setting, to then see if we can get a better, more functional hand and more distal upper limb control" (Alice: 87).

Postural control was considered to be influenced by ability to interact with the supporting surface and specific positions were considered to make movement easier or more challenging and this supported decisions about the body position in which treatment should be provided.

> “If they’ve got such an awful trunk that they can't stabilise I’ll put them in side lying or lying so that if they’ve got some activity, they’re not worried about trying to keep themselves upright that they can't use their arm. I would vary the position that I treat the arm in, depending on the ability of the patient” (Alice: 191-193).

> “There are a load of trials that show it is base of support activity rather than core activity that is the prime activity in normal movement” (David: 65).

4.5.3.3b Specific aspects of motor control

Comments of most participants indicated belief that movement was based on static and dynamic control of all components within a movement. Thus scapula and thoracic alignment was integral to movement of the arm, arm positon was important for movement of the hand. Therapists identified sequences of muscle action and joint positon from both a global and a specific perspective. These sequences were described as “movement patterns” and considered in relation to a perceived “normal” in order to identify aberrant areas which required treatment.

> “I’ll look globally at the movement patterns and the alignment through the whole body and including the upper limb. Starting from the scapula, how that relates to the thorax then working my way, kind of distally to proximally, round the rest of the upper limb” (Meg: 19-21).

> “One of the things that I find is an inability, or reduced ability, to disassociate or move the arm away from the body so that everything moves in one big block” (John: 219/220).

> “Scapula, control and movement around the shoulder, glide of the scapulae over the ribcage and moving on to the distal joints” (Sue: 153).

This included examination of limitation of movement in order to determine potential cause. Participants examined limited movement from a neurological (caused by the stroke) or biomechanical (secondary to movement imbalance or altered alignment) perspective. This supported

treatment decisions in relation to initiating intervention from a biomechanical or a neurological route, this links with theme two.

> "Some patients I see in the community have functional use back but it's painful because of residual stiffness. I treat it more like a musculo-skeletal assessment. Looking at range of movement, strength, any shortened tissues, any tightness in the joints and the muscles themselves" (John: 49/61/ 62).

4.5.3.3c Specific indications supporting decisions about initiating or progressing treatment

Therapists monitored changes in movement control during treatment to determine the area of movement difficulty or the efficacy of their input.

> "The important bit is you have an expected outcome of intervention. If that doesn't happen, then you've either noticed something else that has, or you're immediately asking the question, "Am I treating the right thing? Am I treating the right thing, but in the wrong way?" (Peter: 144).

However, there was some variation in how this was addressed. Some participants reported that observation supported their feedback and decisions other described treatment in which the therapist physically supported the hemiplegic upper limb and "guided" movement. The information given during the interview was often detailed and included decisions about where to hold and how much support to provide; response to this was used to support decisions about treatment during its delivery.

> "I'll have one hand in a hand-shake grip on the patient's hand, at the same time applying my thumb and finger-tips over the wrist to give wrist compression and support the carpal bones. I would have another hand on the distal humerus if their arm is low-toned my second hand would be on the proximal humerus to give an influence up into the glenoid fossa and lateral rotation at the humerus" (Meg: 72-77).

> "If you're working around somebody's elbow can they give you that feeling of elbow extension? You're trying to facilitate reach forward, and maybe initially I've got a hand around the elbow to try and encourage some triceps activity" (Alice: 310).

Regardless of the way that treatment was monitored positive indicators were: improved joint alignment, increased client autonomy and increased range of movement. Therapists employing facilitatory methods cited reduced need for therapist assistance.

> "I look at the effort the patient is putting into it and if I'm getting the desired movement pattern and the desired alignment. Going through the range of movement working from a smaller range to a larger range and how I adapt my handling, so from needing more hands-on to less hands-on" (Meg: 130-136).

> "Do I feel it's in a better position? Are they more aware of their arm? Are they interacting with their arm better? Are they asking me questions about an arm?" (Alice: 327-330).

Client feedback was considered important; this was especially with regard to increasing sensory awareness of movement or position of their arm.

> "And that lovely feedback: they're like, "Oh, yes, I can feel that now." Whereas before, I feel that it's me doing it. And they'll go, "I can feel that." And you think, "Oh, something somewhere is connected. A neural network somewhere that's connecting and that's got to be a start" (Alice: 332-334).

Negative indictors were: inability to isolate movement to appropriate joints and increased non-volitional muscle activity. This was described by therapists as increased tone, associated responses or compensation; these terms are all consistent with the Bobath concept.

> "And you still feel that you're almost extending the patient's arms for them" (Alice: 311).

> "Exaggerated thoracic side-flexion to generate the arm coming forward, and scapula elevation and glenohumeral joint abduction" (Meg: 146).

These characteristics were considered indicative that the therapist should reassess and reconsider their intervention. These were also used to inform decisions about potential level of recovery from stroke.

4.5.3.3e Functional movement

Participants agreed about the importance of relating movement to functional activity during both assessment and treatment although there was discrepancy in the way this was expressed. One participant suggested that once clients could perform movement they would “automatically” transfer this into achieving everyday tasks. Other therapists suggested that they would overtly use function as a component of treatment in order to achieve or improve specific movements. Discussion of movement quality in relation to function was apparent in addressing compensatory movement.

> “To me function just comes. Provided one could emphasise the difference between normal and abnormal movement and the patient had a good base of support to practice from the patients somehow discovered their own new movement” (Mary: 247).

> “If the patient has got enough activity, I’ll get them doing a task, reaching, drinking from a cup I try and make it specific to them” (Alice: 154-156).

> “If I can strengthen or stretch or mobilise or improve coordination within functional task performance then I would try to do that, and that would be important in salience for the patient and motivation and being able to create opportunities for practise outside of treatment” (Peter: 72/160).

Participants considered that tasks relevant to individual clients were more therapeutic that physiological movements. Generally, this involved common daily activities but movements important to individuals were also included.

> “I’ve even had a gentleman who was a carpenter using a screwdriver, to get pro and supination, that worked well because we got a really good grasp and activity. Being task-specific is so much more important than just general range of movement exercises with no focus to them” (Rob: 71-73).

Activity of the hand as part of grasping and manipulating objects was considered pivotal to upper limb function by all participants. Treatments identified were aimed at ensuring pliability of the palm in order to match the shape and alignment of different objects, in addition to increasing joint range and strength of the fingers. Sensation was considered an important component of movement and especially of hand function.

> “Then I might explore the hand, to see if I can achieve some activity. Placing, weight-bearing through the hand, the shaping movements of the hand, functional activity to get the intrinsics working a little bit more. Assisting with grip of different objects and different surfaces, trying to relate the hands to functional items” (Meg: 110-113).
>
> “Sensory contact would be a big factor, particularly in relation to the hand. That might be part of regaining functional recovery of the hand, but it also would be a big part of gaining better motor control of the arm” (Peter: 84).

Thus decisions about treatment were based on a range of factor including the body position support which would be most effective in allowing upper limb moment, consideration of re-establishing control of all parts of the chin of movement, evaluation of the effect of treatment components and the need to make arm movement relevant for function.

4.5.3.4. *Theme 4: Holistic overview*

Subthemes

a. Patient and their body
b. Patient and emotions

4.5.3.4a Patient and their body

This theme is based on an area acknowledged in theme 1. Participants assessed motor control of separate body parts and also considered movement of “the body” as an entire unit. All participants discussed the importance of sensation in relation to movement control and this was considered an important factor supporting decisions about treatment. Therapists regarded sensory awareness both specifically as part of function (for example in order to support hand shaping and development of grip) but also from a wider perspective as part of the way that the client experienced, interpreted and related to their surroundings.

Participants explained this as part of their understanding of the effect of stroke on sensory integration areas in the brain and included medical/physiotherapy terminology such as “neglect” or body “schema”. All participants discussed the need for treatment increase sensation, however

rather than simply increasing response to sensory stimuli this also involved using touch as a means of increasing overall awareness of the upper limb. One participant described this as “re-orienting” the client to their body.

> “If they’ve got a really raging neglect, you might spend some of the session trying to get them to acknowledge they’ve got an arm. To raise awareness, they actually have an upper limb (Alice: 162/163)

> “A patient I worked with yesterday had increased tone in her leg and lying down was a good place to reduce that. Every now and again I would move from the legs and the body to working with her arm, so that the arm was included in the whole schema” (Alan1: 18/19)

Another strand of discussion explored this from a different aspect and participants acknowledged that for some clients’ stroke affected the way that they related to their own body in a deeper sense. Disordered internal awareness of their own body was associated with lack of interaction and what the therapists described as an emotional distancing. Participants with different levels of experience described this in different ways.

> “It’s a whole gestalt of where is this person in terms of relating? Very often they’re coming through my front door, but sometimes I’m seeing them in a nursing home or at home. It can be in quite a distressed place. The important thing seems to be this, try and stay with that and not panic and start to make a bolt for techniques that are going to fill the space” (Alan1: 24).

> “Some patients who have had poor motor recovery, quite a flaccid limb and because they’re not using it, they’re a little bit disengaged and reluctant to being involved in treatment” (John: 267).

4.5.3.4b Patient and their emotions

Therapists considered that stroke had an emotional impact, secondary to the experience of change and the effect of the resultant disability on independence and social role. Emotional trauma was described from the outset as part of acute stroke and participants were aware of further impact as level of recovery became apparent.

> "There's a kind of stigma of being disfigured and asymmetrical and of being sick. The passivity of being cared for and loss of autonomy. These are all huge issues when it comes to the body being active or not. Emotionally and socially in terms of the culture or caring and family relationships, psychological interactions that are taking place. There is 'physicality' about patients' experience of non- movement" (Alan1: 37-42).

Client mood was perceived to respond positively to achievement and this was thought to increase engagement and interaction. Therapists discussed focussing assessment on areas where clients had returning movement and sensation and of avoiding drawing attention on areas of loss. One participant described that he altered the difficulty of movement required during treatment in order to ensure that a successful movement was achieved at the end of the session.

> "I don't want them to fail, so whatever we're doing, I always want the overriding feeling for the patient to be that they have succeeded in something, even if that's not what we set out to do" (Rob: 79/ 80).

Thus therapists considered the wider effects of stroke. Sensation was considered in relation to movement, body awareness and location within environment. Both sensory loss and emotional trauma were considered by some participants in relation to self-awareness, self-definition and self-esteem.

4.5.3.5 Theme 5: Therapists view of their role

a. Therapist has responsibility for decisions about treatment
b. Client and therapist working together
c. Therapist needs to try to understand from the perspective of the patient and their family

4.5.3.5a Therapist has responsibility for decisions about treatment

Therapists' described the need to make treatment decisions which addressed their professional responsibility to the client and incorporated the client's thoughts and feelings. Participants considered that their role was to use their knowledge of movement and previous experience of stroke to ensure that the client achieved the highest possible movement quality and

maximum function. Further, they should prevent the long term effects of stroke, for example altered joint position or pain.

This was an aspect where the therapists seemed to demonstrate almost "paternalistic" practice. This was articulated particularly by those who worked in the acute sector and the most frequently cited area was related to pain.

> "Regarding upper limb, in the back of my mind, there would be shoulder stability, shoulder pain issues. That would be quite a priority, if they weren't already managed, looking at if any further damage can be caused to the shoulder" (Emily: 30-32).

> "I would be very careful about elbow extension and shoulder position; they can get so painful, can't they? If their shoulder is getting trapped" (Alice: 181/182).

Participants described their need to base treatment decisions on the client's perspective and objectives. However, they identified dichotomy if these objectives were incompatible with client's level of movement control. Participants reported awareness that treatment goals should be decided by the client but they also explained that it was hard to achieve this because not all clients' had specific goals. All expressed difficulty and concern in setting goals with clients' who had very limited recovery or had speech and language difficulties or neglect.

> I involve the patient and try and make the therapy that I'm doing meaningful to them in their previous activities. A lot of our patients have no idea what they want to achieve or how they're going to get there. So they just go, "Well, I don't know." And everyone is saying, "Oh, you need to have a patient-led goal" (Alice: 268/274).

Equally, if clients' goals were not achievable comments suggested that therapists "overruled" the client's decision and a variety of strategies were employed. One participant provided direction for clients if the desired goal was too challenging. This was described as having a "realistic" approach and was more common for those who worked in acute care, perhaps because of reduced client insight in the early stages of recovery. A different strategy was to orientate the client to an area where treatment might be successful.

> “If they want to get back to playing Beethoven’s Moonlight Sonata, and they’ve got absolutely no activity in their left upper limb whatsoever, I’ll have that discussion, I think I’m very realistic with them” (Alice: 265/266).

> “If the arm is a possible area of improving performance, but it’s a less explicit motivation for the patient then you might start to move their attention towards areas of their movement control that would be positive in getting arm recovery, creating motivation that “my arm could be better” (Peter: 55).

Therapists felt that they needed to direct clients about treatment which they may not have the theoretical knowledge to consider. For example, in the early stages of recovery many clients are focused on regaining walking but research suggests that upper limb arm treatment is equally important.

> “How do I convince the patient when they want to be up on their feet, that it’s equally important that they can extend their arm or their wrist? That if they’re standing up, it’s as important to concentrate on not getting flexor pattern in the limb, as it is to ensure that you get knee extension for maintaining them upright” (Rob: 145).

Therapists described responsibility to the client to understand the factors contributing to the movement problem in order to make decisions about treatment. This was expressed in terms of therapist’s ability to interpret assessment findings in relation to propositional and experiential knowledge. Therapists identified this to be an important aspect of their role and it an area requiring reflection.

> “Occasionally you get the patient who develops increased tone very early on and you have to think “why is this happening.” “Can I position them better?” “Can I provide more support in different postures to try and reduce that?” (Meg: 158-160).

> “When you don't get what you want, you stop and think, “Why didn't I?”. When you do get a result, you stop and think “why?” For me, it’s about exploring that bit where we’re thinking “why?”” (Emily: 266-268).

A further interesting finding was the use of a personal pronoun “I” by some therapists when referring to a client’s arm. Despite acknowledging the role of the client in making decisions this seemed to indicate personal association with the limb and ownership of the movement problem.

> “I’ve done the assessment; I know what movement I have got. I find it difficult to work out a clear functional path when I have very low activity in and around the upper limb” (Rob: 143/146).

> “I think, “Well, I’ll get a good result if I put that in” (Emily: 120).

4.5.3.5b Client and therapist working together

Despite expressing some difficulty in establishing client goals participants agreed that these would define their objectives or discussed regarding level of difficulty and possibility of achievement. Another perspective described by one very experienced participant working with less acute clients was that some clients have awareness of the problem areas and can direct the therapist.

> “And then what the patient states in terms, “I have got a problem with this”, “I used to be able to do this” and “I would like to do this” then from that we will set the goal and intervention” (Sue: 130-132).

> “Often people will be in the right place with where they see an underlying component problem. But how they describe it might be more indirectly. They’ll often describe something that will give you a clue as to where the most significant problem area is” (Peter: 125).

Goals seemed to function as an objective, a means of measuring treatment efficacy and a motivating tool. To this end some participants explained that if clients’ expressed strong desire to regain specific movement they would be influenced by this, even if they believed this goal was unachievable.

> “If I find there’s no activity in the arm, then I think my choice of interventions is limited. But if the arm is important to them, and their focus is on the arm then I would probably give it more intervention than I would have normally” (Sue: 175-178).

However, despite difficulties, goal setting was considered to be part of collaborative therapy based on discussion, information and agreed decisions. It was agreed that this was easier with clients with greater recovery and therefore more functional options and more interactive approach within therapy.

> "One gentleman referred himself because he wanted to work on his upper limb movement. He's engaged in the therapy because it links in with his goals to improve his washing or his dressing. That's what he wants to achieve, and I'm giving him the stepping stones to get there" (John: 274-278).

Building trust was considered important for collaboration; one therapist gave a very specific example

> "(one) Gentleman was a piper (bagpipes) and we got him back to rudimentary playing the pipes with his affected arm. He understood immediately the importance of what we were doing and there was a huge amount of trust between us, he knew if I was asking him to do something, there was a reason for that" (Rob: 129-131)

Another participant described detailed discussion of the client's experience of their movement to assure the client of shared awareness of their therapy objectives and to guide the therapist.

> "I say, "What feels to you the most difficult thing about moving your arm? Or taking hold of that cup, or picking your bag up?" It's a nice way to get into assessment and demonstrate to the patient that you're immediately recognising what's important to them. It also helps to corroborate my reasoning in terms of what I'm observing and feeling and testing" (Peter: 127 – 132).

Comments indicated that participants considered it important to support clients to regain movement in response to their own wishes and to meet their own needs. This was especially apparent in relation to movement which remained aberrant. There were two strands of discussion; the first was in encouraging clients to work on a task and gain increased practise in anticipation that this would improve motor control. The second was in deliberately teaching a strategy which would allow a function which was important to the client but for which they did not have the necessary recovery.

Therapists described collaboration through negotiation so the movement which the client used was the "least destructive" pattern possible for the patient to achieve. This was more likely to be identified by therapist aligned with the Bobath concept (facilitatory approach).

> "If I hold them back because the movement of the arm is not exactly the way I wanted it, that would stop them doing practise. So I would probably allow them to continue with the movement and keep practising that movement as long as I feel that it will not give them secondary complications and problems" (Sue: 260 – 263).

> "A gentleman who attached a little box with scripture in to his upper arm, as part of his prayer. We could only get so far with his movement recovery and we looked at strategies to use his affected arm to just manage that particular task. That was a developed strategy between us for him to do something that was relevant and important to him" (Peter: 101).

4.5.3.4c Therapist needs to understand experience of stroke from the perspective of the patient and their family

Participants reported that one means of interpreting assessment findings was to discuss these with the client. However, this required awareness of impact of stroke from the client's perspective. Interestingly both the most philosophical and the most empirical participants explained the importance of giving clients and their families' time to assimilate what had happened.

> "The temptation is to do something. But, what's important is to acknowledge what's actually happening. Can I understand what's really important? And can I resist the temptation to fill the spaces so that it feels more comfortable" (Alan3: 26)

> "Acute patients were fatigued and in a state of stress and emotional shock, the problem is inside their head so they can't see it. They are also afraid of being in hospital" (David: 41)

Finally, participants, especially those working in the acute sector indicated awareness of the impact of stroke on the family. This was explained both in empathic terms regarding their experience and of frustration that family members may express unrealistic expectations regarding the level of functional recovery which the client will achieve.

> "I try to bring family into it, but they've got so much on their plate with this life-altering thing that's happened. They want to help but I don't want to make them feel like they have to do this thing for someone every day when they should just be thinking about how to support them emotionally" (Emily: 216-219).

> “Families can be difficult and challenging in their expectations. I think people forget, even with the wonders of modern science, we can't fix everything” (Alice: 280/281).

Thus therapists identified that their role in relation to clients’ included responsibility and collaboration. This was difficult to balance especially as stroke has an impact on areas which affect communication and comprehension. Awareness of the emotional impact of stroke on families and comments suggested that therapists found it hard to provide the support which was sometimes needed.

4.6 Discussion

Discussion of findings in section 4.6 is supported by the evidence provided through themes derived and quotes presented in section 4.5.

4.6.1 Overview

All participants’ comments are important, Roberts (2002) emphasised the importance of including all data so that a complete report is offered. However, participants’ responses varied, some explored topics with minimal interruption from the researcher, others gave concise answers and the researcher needed to prompt in order to cover the areas outlined on the interview topic list (Appendix xiii). Interviews lasted between 30 and 45 minutes; thus some participants provided more data than others.

Themes reported appeared most frequently and seemed central to the clinical decisions made by participants. These included background beliefs about the assessment process and the role of the physiotherapist. Decisions about inclusion and application of specific modalities were influenced by interpretation of assessment findings and level of service provision. Importance was attached to considering the experience of stroke from the perspective of the client and their family.

4.6.1.1 Theme 1: Beliefs about assessment

Subthemes:

a. Assessment relates to the entire person
b. Assessment is an ongoing process
c. Assessment is contextual

4.6.1.1a Assessment relates to the entire person

Assessment included information about different aspects of clients' upper limb movement. Complete assessment included specific information about movement and sensation of the hemiplegic arm and wider information about the relationship between arm movement and movement of other areas of the body, especially the trunk with respect to balance. Additionally, overarching information was recorded about client awareness of their body, and arm movement in relation to their environment and features of specific objects.

Thus assessment supported evaluation of specific information about the motor control of the arm as part of the movement, environmental interaction and function of the whole person. This supports the findings of Thornquist (2001b) which identified that assessment by community therapists established not just individual movements but also the person's capacity to relate safely to the demands of their environment. Further these findings demonstrate this in relation to the specificity of rehabilitation of the upper limb.

Assessment findings were used by therapists to identify and understand links between upper limb impairments and their effect on function of the person as a whole. This reflects the World Health Organisation model: International Classification of Function (WHO, 2001). Especially those section which consider 'body structure and function' and 'activity' which demonstrates the existence of relationships between altered movement, altered function and opportunity for participation. Frew *et al.,* (2008) suggested that this model could provide supporting structure for assessment, clinical reasoning and

MDT communication and identified that this permitted scientific reasoning (understanding the nature of the condition) and narrative reasoning (understanding the person as an occupational being). The findings of this study suggest accord with the feasibility of this suggestion and indicate that clinical reasoning embraced these constructs for this group of participants within the context of assessment and treatment of the hemiplegic upper limb.

Existing work explains the need for the assessment process to allow therapists to collect information which supports their understanding of the effect of specific areas of altered movement control on reduction of wider function (Tyson & DeSouza, 2003). The findings of this study provide an example of this in relation to assessment of the hemiplegic upper limb.

4.6.1.1b Assessment is an ongoing process

Information collected during assessment was used sequentially by therapists to support further decisions about the content and structure of further assessment. Examples provided were examination of arm movement in a specifically selected posture which promoted movement, or assessment of specific features of movement only if background movement indicated information about this would influence decision making.

Findings from this study suggested that therapists considered movement components specific to the individual but related these to understanding movement of the entire person with respect to function. This requires that therapists understand the effect of specific components on overall movement. The model proposed by Tyson and DeSouza (2003) in relation to posture and balance suggest that the components of assessment can be used to understand movement at all levels by determining what movements the patient can execute, how these are undertaken and evaluation of why movement occurs in this way.

Therapists described that they altered the difficulty of the movements they assessed in relation to the client's control so that assessment was structured, flexible and client specific. This finding supports the model proposed by Tyson and DeSouza (2003) in which assessment of the movement executed by a client is explored in increasingly greater depth in order to build understanding. The model proposed by Tyson and DeSouza (2003) addresses this by assessing the number of body segments which the client can control within a specified environment. In their model this is related to increasing the challenge on posture and balance. However, the process described in this study in relation to using assessment to understanding movement of the hemiplegic upper limb demonstrates that this model can be applied to progression of assessment in another area of neurological physiotherapy practice.

Thus there was a cyclical process of assessment, intervention and reassessment. This matches the findings of McGinnis *et al*., (2009) in which data gathering was shown to overlap with diagnosis and planning such that decisions were made about planning during the period of data gathering and influenced the type of data collected. However, the findings of this study extend their model by including feedback from treatment phase as part of data gathering and emphasising the relationship between analysis of the actual effect of the intervention against an expected outcome. Additionally, this study provided examples of "indicators" which therapists treating the hemiplegic upper limb used to support this process. There is little work available which discusses clinical evaluation of the upper limb after stroke in this detail and it is an area where further exploration would be useful.

4.6.1.1c Assessment is contextual

This study demonstrated that the assessment process influenced by features specific to the client and the purpose of the assessment. This included collection of data to support prediction of level of recovery, to support team decisions and to support decisions to refer to other professionals. Finally,

assessment supported decisions about initiating or altering physiotherapy treatment interventions.

This demonstrated the number of different types of decision which are required by therapists and is in accord with the work of McGinnis *et al*., (2009) which identified that decisions about which data to gather is done so with respect to prior evaluation of medical and demographic information.

With regard to decisions about treatment participants used a combination of hypothethico-deductive reasoning and pattern recognition; this is in accord with the dual process model suggested by Crosskerry (2009) in which patient presentation is subjected to intuitive and logical analysis in relation to clinical indicators and treatment context. The findings of this study are in accord with suggestion that this should be considered as a continuum; some decisions for example those in relation to assessment and treatment of very high or very low muscle activity at the shoulder were clearly based on pattern recognition about an area of pathology which is easily recognisable and well supported by treatment recommendations (ISWP: RCP, 2012). Decisions about position for assessment or therapists handling were based on establishing and verifying an overt hypothesis (Jones, 1992).

4.6.1.2. Theme 2: Influences on treatment

Subthemes

a. Structure of service
b. Evidence based practice
c. Therapists' background knowledge

4.6.1.2a Structure of service

Participants identified that staffing levels influenced treatment decisions in relation to both type of intervention and number of treatment sessions, this is supported by Hajjaj *et al*., (2010) which suggested that non-clinical factors have an important (but frequently unacknowledged) influence on clinical

decisions made by medical teams. Additionally, those participants working in community based stroke rehabilitation identified that high work load resulted in patient prioritisation for treatment which endorses observations of McLinchey & Davenport, (2014) in acute stroke care; that non clinical issues including staffing limited time for treatment delivery.

Treatment to improve function was addressed both in isolation and in combined sessions with other Therapy professionals especially in the acute sector. This study is too small to support or refute the findings of Buckman, (2013) which suggested that this is not common practice. Additionally, there may be participant features linking willingness to support research and MDT working but the finding cautiously suggests growth of an in-patient Team approach. This is identified in guidelines for best practice (NICE 2013; ISWP: RCP, 2012) and evaluated via National Royal College of Physicians Sentinel Stroke Audit Programme data (SSNAP, 2015). The examples given of combined treatment were consistent with those identified by De Wit *et al*, (2007) as part of occupational therapy practice. This may reflect the focus of this study on rehabilitation of the upper limb which has been associated with occupational therapy more than the lower limb. It may also indicate changes in physiotherapy practice secondary to application of research findings about repeated task specific movements supporting embedding of specific movement into function.

4.6.1.2b Evidence based practice

Conflicts expressed by participants in this study were providing person centred care within available funding and lack of coherence between research protocols or populations with specific clients. Research evidence and practice recommendations were compared with client assessment findings and interventions “adapted” in order to preserve those components considered appropriate. These findings supported previous work identifying therapists’ awareness of research (Cott, Graham & Brunton, 2011) and the barriers to implementation of Evidence Based Practice (Iles & Davidson,

2006; Metcalfe *et al*., 2010). This may also reflect the experience and level of postgraduate education of the participants in phase 2; master's level study has been shown to improve confidence in and complexity of clinical reasoning (Green *et al*., 2008; Rushton & Lindsay, 2010).

4.6.1.2c Therapists background knowledge

Although participants acknowledged the influence of the Bobath concept most considered their treatment to be based on a mixture of approaches; these are similar to findings of Davidson and Waters (2000) and Lennon (2003). Treatment suggestions were supported by participants' individual interpretations of existing theory and discussed in relation to personal experience. They were consistent with the assessment structure discussed in the previous section.

These included interventions to address bio-mechanical, neurological and functional features of movement control. Some interventions had supporting research evidence (for example constraint, functional electrical stimulation, muscle strengthening), some were rooted in paradigms including the Bobath concept and the Motor Relearning Process. All delivery was tempered by service structure and staffing (Hajjaj *et al*., 2010; McLinchey & Davenport, 2014).

These findings are in accord with the range of physiotherapy content identified in previous work (De Wit *et al*., 2006; Tyson & Selley, 2006; Donaldson, Tallis & Pomeroy, 2009; Tyson *et al*., 2009; Winter *et al*, 2011). They also support the findings of Lennon, Baxter and Ashburn (2001), Lennon (2003) and Davidson & Waters (2005) that there is variation in physiotherapy content despite consistency in the aim of treatment.

Additionally, the findings for phase 2 of this study support previous studies that physiotherapists' decisions are influenced by knowledge base and clinical experience (Case, Harrison & Roskell, 2000; Doody & McAteer,

2002; Edwards *et al*., 2004; Smith, Higgs & Ellis, 2008; Wainwright *et al*., 2011; Petty, Scholes & Ellis 2011) rather than research evidence. This study expands work in this area by demonstrating that differences are found even in very specific areas of treatment (that for the hemiplegic upper limb) and suggesting that there is consistency in the theoretical influence cited but that differences may result from the weighting ascribed to this by individual participants.

Participants employed theoretical knowledge to interpret features of presentation in order to predict response to treatment. Features mentioned are supported by existing research: time since stroke (Ward & Cohen, 2004; Ganguly, Byl & Abrams, 2013), motivation (Byl, Pitsch & Abrams, 2008), balance and specificity of movement recovery especially in relation to hand function (Katrak, Bowring & Conroy, 1998; Ilett *et al*, 2010). Thus despite a bio-psychosocial approach to decisions about treatment therapists also employed aspects of a medical model to relate the underlying pathology and movement related indicators to possible response to treatment. Although this argument should be approached with caution; only one participant identified that the size and positon of the lesion would indicate likely level of recovery despite the primacy of this as a prediction factor in neuroscience and medical literature (Ward & Cohen, 2004; Ganguly, Byl & Abrams, 2013).

4.6.1.3 Theme 3: Perspectives during assessment/treatment

Subthemes

a. Clients' postural control and interaction between gravity/base of support
b. Specific aspects of motor control
c. Specific indications supporting decisions about initiating or progressing treatment
d. Functional movement

4.6.1.4a Clients' postural control and interaction between gravity/base of support

Consideration of postural control is a component of physiotherapy treatment based on both the Bobath concept and the Motor Relearning Process (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd 2010). The importance of equilibrium responses and feedforward and feedback mechanisms to place the body for function is documented in neurology text books (Kandel *et al*, 2012; Stokes & Stack, 2013) and with respect to the upper limb this requires activation of all levels of the spine in order to position the eyes, stabilise the scapula and align the body for the task (Shumway Cook & Woollacott, 2011; Schmidt & Lee, 2013). Extant research has demonstrated altered trunk kinematics as a consequence of stroke (Roby-Brami *et al*., 2003).

Consideration of this was apparent from the findings of this study. Physiotherapists described selecting positions and features of supporting surfaces during assessment and treatment in order to support, challenge and activate postural mechanics as required for the individual client.

This is in accord with the model described by Shumway Cook and Woollacott, (2007) such that features of the task are manipulated in order to address features related to the 'individual'. This is also supported by the model proposed by Tyson and DeSouza (2003) but extends their work by demonstrating that the environmental challenges to balance suggested as components of assessing postural control (reducing size of base of support) can also be used to increase challenge to this same mechanisms part of activating postural control mechanisms during treatment.

4.6.1.4b Specific aspects of motor control

Participants assessed specific features of movement which were discussed in theme one and selected modalities to treat problems from a biomechanical (e.g. joint mobilisations to improve alignment and range of movement,

increasing muscle strength and endurance), neurological (increasing sensory feedforward and feedback, refining patterns of muscle activity) and functional (task specificity) perspective which was discussed in theme two. The findings of phase 2 of this study thus far support some aspects of the model provided by The International Classification of Function (WHO, 2001) which considers movement from the perspective of body structure and function and the effect on activity. This model also includes the influence contextual factors, for example the social and physical environment and personal aspects (including emotions).

Participants were drawn from acute, rehabilitation and long term services following stroke. Thus psychological issues identified by participants varied from initial shock and fear of client and family in acute stroke, to assisting with coping with long term reduction in movement, function and potentially altered opportunity for social participation and change of role. Results of this study therefore suggest that physiotherapists consider treatment decisions from a bio-psychosocial perspective which is in accord with professional directives and person centred care (ISWP: RCP, 2012; NICE, 2013).

4.6.1.4d Specific indications supporting decisions about initiating or progressing treatment

Information intended to support therapists' selection of treatment modalities is available in published clinical guidelines (ISWP: RCP, 2012; NICE, 2013). However, the supporting evidence for most modalities is weak and the guidance is thus couched in terms of suggesting that interventions be 'considered' rather than providing directive advice. Symptom management which is best supported by evidence are for those physiological features which overlap with medical management and can be addressed through immobilisation or medication.

The work of Donaldson, Tallis & Pomeroy (2009) and De Wit (2006) provides examples of potential content of physiotherapy, some support for selection and application of interventions is available in physiotherapy texts (Bassoe

Gjelvik, 2007; Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010). Models provide structure to support assessment and identification of problem areas (WHO: 2001; Tyson and DeSouza (2003) but they do not provide detail which directs clinical decisions about treatment.

Thus findings of this study are in accord with those of other research. That interventions are synthesised by individual practitioners, that the primary influences are background knowledge and experiential learning and that research findings are interpreted in relation to their relevance to individual clients (Masley *et al*., 2011; Davies & Howell, 2012).

The findings of phase 2 of this study extend existing knowledge by providing detailed information regarding therapists' rationale for selecting, amending and progressing treatment modalities. However, it was identified in theme 1 that therapists considered assessment and treatment to be integrated and thus discussion of rationale was expressed by participants in terms which were aligned with the two dominant paradigms and related to areas of assessment including biomechanical, neurological and functional indicators. The findings are related exclusively to treatment of the hemiplegic upper limb and must be treated with caution as participants were drawn from all timeframes on the pathway and findings may lack transferability.

4.6.1.4e Functional movement

This study demonstrated that therapists included both daily tasks which were common to the needs of all clients and movement which were personally relevant to individual clients.

A considerable body of evidence supports the value of relating movement used in physiotherapy treatment to functional activity Dobkin, 1998; Hayward, Barker, & Brauer, 2010; Kimberley *et al*., 2010). This forms one of the key areas of person centred care and is emphasized within guidelines for rehabilitation after stroke (ISWP: RCP, 2012; NICE, 2013). Findings of

phase 2 of this study demonstrate that decisions about treatment are supported by these areas of research and recommendations for treatment.

Practice of components of a function in addition to the entire task is specifically identified within the Motor Relearning Process and the Bobath Concept but a key difference is the value which is ascribed to the quality of performance of the task which is specifically considered within the Bobath concept (Graham *et al*., 2006; Raine, 2006).

Functional movement was identified as a component of both assessment and intervention and was assessed and treated in relation to normalising and utilising patterns of motor control which is in accord with both paradigms (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010). The work of Davidson and Winter (2000) suggested that therapists aligned with the Bobath concept limited client's function to that based on their optimum level of control. Findings of this study suggested that participant's considered all functional movement valuable and encouraged relevant task related practice but balanced complexity of task with level of control and employed negotiation so the movement which the client used was the "least destructive" pattern that the client could control.

Therapists were divided about the use of dynamic splinting to support work on a task which clients could not achieve independently and this was overtly descried as being incompatible with the Bobath concept philosophy. This suggests that there is some difference in approach to embedding of task related practice into treatment and this may be based on alignment to a specific paradigm. This is an area which should be explored further

4.6.1.4 Theme 4: Holistic overview

Subthemes

a. Patient and their body
b. Patient and emotions

4.6.1.5a Patient and their body

Participants considered “the body” in several ways. The simplest was from a biomechanical perspective of linked physical components such that stability of one component permitted movement of another and is consistent with theories of motor control (Shumway Cook & Woollacott, 2007) this has already been discussed in theme one.

At another level sensori- motor integration was described in terms of proprioception and body schema and is consistent with motor control theories (Kandal *et al*., 2012; Shumway Cook & Woollacott, 2007). Treatment of sensory loss involved activation of feedforward and feedback mechanisms to increase client awareness of separate body parts in relation to one another and of the entire body position in relation to the environment. The two primary paradigms support slightly different interpretations of neuroscience with regard to sensation. Proponents of the Motor Relearning Process suggest that sensation must be experienced as part of action. Bobath concept treatment supports this but in addition additionally endorses the value of independent sensory stimulation in preparation for movement Raine (2006); Graham *et al*., (2009). It is not apparent from participant comments which perspective was being followed.

4.6.1.5b Patient and emotions

The findings of this study support existing work that physiotherapists working in stroke rehabilitation consider psychological and social factors in addition to movement (McGlynn & Cott, 2007). This is mentioned specifically within defining features of the Bobath concept (Raine, 2006); Graham *et al*., 2009). Additionally, this study provides specific examples related to the upper limb of the perceived link between sensory and motor loss and the psychological effect of reduced emotional and social engagement.

However, participants also seemed to interpret movement and sensation at a deeper level and reported that loss of these affected interaction with others. Participants described this as “disengagement” rather than simply lack of awareness which suggests an emotional component. Models relating to the function of the upper limb include communication and interaction (Raine, 2006). The findings of this study are very modest but suggest that some therapists perceive an effect of sensory and motor loss on the client’s physical awareness of “self”. This is in line with emerging suggestions that therapists should consider “embodiment” as a concept influencing treatment (Nicholls & Gibson, 2010).

4.6.1.5 Theme 5: Therapists view of their role

a. Therapist has responsibility for decisions about treatment
b. Client and therapist working together
c. Therapist needs to try to understand from the perspective of the patient and their family

4.6.1.6a Therapist has responsibility for decisions about treatment

Findings of phase 2 of this study reflected those of previous work and included concern that clients’ lacked the knowledge and experience to have insight into their current therapy need and future problems. Therapists expressed conflict between their professional responsibility to help clients’ gain high quality movement and function and client agency and freedom of choice about treatment. Additionally, communication difficulties after stroke limited discussion at appropriate level for an equal partnership which is acknowledged by Sim, (1998) and Schreiber & Stern, (2005). These aspects were articulated particularly by those who worked in the acute sector. It is possible that adoption of this “paternalistic” practice is based on perception of client vulnerability during the period of greatest neuronal recovery and perception of responsibility for “protection from harm” (even if this harm is generated by the client themselves).

4.6.1.6b Client and therapist working together

However, despite this concern, all therapists identified the importance of establishing goals in association with clients if possible and those therapists who reported deliberate discussion of client concerns about function were drawn from all levels of experience. Existing work suggests that this indicates expert behaviour (Davies & Howell, 2012; Jensen, *et al*., 2000; Jensen, *et al*., 2007) but it is possible that this also reflects recent emphasis on person centred practice and incorporation of this into professional standards and behaviour (ISWP: RCP, 2012; NICE 2013). This theme is explored further in phase 3 of this study.

4.6.1.6c Therapist needs to try to understand from the perspective of the client and their family

Findings suggested that therapists' considered that their role included providing information about stroke and potential for recovery but that communicating this accurately and sensitively was challenging.
This theme demonstrates therapists' commitment to client inclusion, but was in accord with extant studies which identified that therapists' have concerns regarding clients' background knowledge required for accurate goal setting and treatment decisions and that this impacts negatively on collaborative practice (Wottrich *et al*., 2004; Proot *et al*, 2007; Rosewilliam, 2011; Schoeb & Bürge, 2011). Although honesty about client potential for recovery and achieve their personal goals was valued, participants reported taking care in selection of activities and discussion to reduce emotional impact and fatigue. This is in accord with Parry (2005) suggested that therapists' communication during treatment may not convey detail to clients when a movement is poorly executed. Parry (2005) suggested that this indicated therapist's concern for client emotional wellbeing and dichotomy about different aspects of person centred practice. This theme is explored further in phase 3 of this study.

Participants in this study additionally acknowledged the role that family members play in rehabilitation decisions after stroke and the expectations of

clients' and family regarding recovery. This is in accord with extant studies which identify the importance of family members in supporting recovery and the need for timely and accurate information and sensitive consideration of family dynamics (Palmer & Glass, 2003; Cameron & Gignac, 2008).

4.6.2 Summary

The results of phase 2 suggested accord regarding the possible "biological" content of physiotherapy assessment for the hemiplegic upper limb after stroke. This was based on stroke pathology and theories of motor control. Treatment decisions were based on assessment of biomechanical and neurological features of movement and consideration of psychological and social issues for example participation, environmental engagement.

Specific content and the position in which this was assessed were influenced by the findings of previous components of the process and the purpose for the assessment. Thus assessment was adapted to the clients' presentation and not formulated as a mandatory test series. However, physiotherapy assessment had underpinning structure and rationale. These findings are in accord with physiotherapy texts about neurological assessment (Stokes & Stack, 2013) but provide specific context in relation to the hemiplegic upper limb.

Theoretical background was synthesised from a number of sources which therapists provided a basis for decisions about assessment and treatment. Overarching content of assessment and intervention was generally consistent but degree of alignment to differing paradigms of neurological physiotherapy influenced delivery. This is in line with previous research about the influence of teaching and knowledge on therapists' decisions (Case, Harrison & Roskell, 2000; Doody & McAteer, 2002; Edwards *et al*., 2004; Smith, Higgs & Ellis, 2008; Wainwright *et al*., 2011; Petty, Scholes & Ellis 2011). Additionally, phase 2 of this study was in accord with work that suggested that therapists have similar aims but that there are differences in

content and delivery of interventions (Lennon, 2003). This study extended those findings by demonstrating some areas of rationale underpinning those differences.

Findings expand existing knowledge by demonstrating therapists' awareness of similar theoretical areas, similarities of content of interventions but influences of different neurological treatment paradigms on delivery. Greatest impact on assessment process, treatment selection and delivery was degree of touch and guidance (termed facilitation by Bobath concept teaching). Therapists described similar movements, but the terms used to describe these and the use of therapist led movement in order to assess and treat features of clients' motor control varied.

Participants described high levels of responsibility for outcome and expressed value for collaborative person centred care but discussion suggested that collaboration was led by and weighted toward the views of the therapists. This supports existing research findings (Wottrich *et al*., 2004; Schoeb *et al*., 2014).

Participants expressed consideration of the entire person in physiotherapy assessment which indicated a holistic approach. This was primarily based on consideration of sensory integration and the impact of the emotional response to stroke movement within assessment and treatment but findings indicated some awareness of philosophical interpretation of the body as part of interaction and identity. This supports the findings of McGlynn & Cott, (2007) and provides an example for Nicholls and Gibson (2014) suggestion that therapists should include "embodiment" as part of practice content.

Assessment and treatment decisions used dual process reasoning (Crosskerry, 2009) and included features of existing models (Tyson & DeSouza, 2003; McGinnis *et al*., 2009). Additionally, the components of the WHO model (ICF: 2001) were included and participants described a reasoning process through which relationships between specific areas of

movement pathology (body structure and function/impairment) and effect on function and participation were explored and addressed.

CHAPTER 5: Phase 3: Semi structured interviews supported by viewing a video recording of an individual treatment session.

5.1 Introduction

Results from the previous phases identified and confirmed the need to further explore clinical decision made by physiotherapists during delivery of an intervention. However, physiotherapy is an interactive process and clinical decisions during a therapeutic intervention are thus influenced by both therapist and client (Barr & Threkeld, 2000; Edwards *et al*, 2004, Kidd, Bond & Bell, 2011; Smart & Doody, 2007). Therefore, research aimed at exploring and understanding clinical decisions during treatment delivery should be considered from the perspective of both participants.

5.1.1. Data collection using video recording

Analysis of video recordings has been used previously to support qualitative research methodology in physiotherapy. Areas of practice included therapists communication style during treatment (Barnard, Criuce & Playford, 2010; Parry, 2004 & 2005; Roberts & Bucksey, 2007; Schoeb *et al*., 2014), features of expert practice (Jensen *et al*, 2000), identification of post stroke joint kinematics (grasping activity: Nowak, 2008; stepping responses: Mansfield *et al*., 2013), establishing reliability/validity of treatment schedules and measurement tools (Donaldson, Tallis & Pomeroy, 2009; De Wit *et al*., 2006; Horgan *et al*., 2006), scoring quality of movement (Pomeroy *et al*, 2003), time spent in therapy or on specific therapies (Kuys, Brauer & Ada, 2006; Hayward & Brauer, 2015).

Thematic analysis of transcripts from audio recorded interview with people who have experienced stroke have been used in exploration of: ability of stroke survivors to work outside of physiotherapy (Eng *et al*., 2014: client n=7, carer n=6 and staff n=22 interviews), client opinions to support stroke service restructure (Jones *et al*., 2008: semi structured interviews and focus

groups with clients and carers, n=35), day to day experiences of living with stroke (Burton, 2000: semi structured interviews with six clients over first 12 months after stroke), client experiences of an exercise referral scheme after stroke (Sharma, Bulley & van Wijck, 2012; semi structured interviews n=9), supporting patient autonomy during rehabilitation (Proot *et al*, 2007: semi structured interviews, n =22) and patient experience during rehabilitation (Wain, Kneebone & Billings, 2008: semi structured interviews, n= 8).

Very few studies employed observational analysis to collect treatment data with individuals after stroke and even fewer augmented observation with video recording; this method is discussed below using examples drawn from this discrete group.

Noll, Key & Jensen (2001) video-recorded treatment sessions to explore clinical reasoning strategies employed by an expert practitioner with high level training, knowledge and experience in “Mackenzie” techniques for treating low back pain. This study involved one therapist expert in Mackenzie techniques and six clients with low back pain; presentation details were provided in the published report.

Initial evaluation and two follow up visits for each patient were videotaped and an interview with the therapist was audiotaped following each session. Videotape of the session provided cueing for the interview during which the therapist reflected on and explored reasoning processes. The interview comprised open and closed questions (which were provided as an Appendix) and responses demonstrated intention when collecting specific subjective and objective information and the rationale for the order and process through which these were evaluated. This method was used to support the method for the current study.

However, although a large body of literature describing interaction with the client as a key feature of expert practice (Doody & McAteer, 2000; Jensen *et al.*, 2000; Noll, Key & Jensen, 2001) and the inclusion in the conceptual

framework of subjective data the perspective of the clients was not included in the data collection. The limitations of what is effectively a series of single case reports are acknowledged in relation to dependability, credibility, confirmability and transferability. This limitation is accounted for in the current study which has also discussed treatment experience from the perspective of the client.

The use of videotape to support the interview was integral to the study as it allowed verification of details of the treatment and avoided reliance on memory. This study supports the value of videotaping clinical interventions in order to facilitate structured discussion and exploration of clinical reasoning using interview.

Two key studies about stroke support the use of video recording of treatment and inclusion of the perspective of clients and therapists. A pilot study including 8 therapist/client pairs undertaken by Durham *et al.*, (2008) explored the focus and frequency of feedback from therapists to clients during treatment of the hemiplegic arm using a multi-methods design (video recordings of treatment, interviews (both therapists and patients) and questionnaire (therapists)). Wottrich *et al*., (2004) conducted a study in Sweden which included the perspective of clients during the therapist/client interaction (nine clients and ten therapists; one patient worked with two different therapists). Data about treatment experiences were collected using observation and semi structured interviews. The therapists group included both sexes and a range of age and experience; patients already worked with therapists and were able to speak well enough to participate in recorded interviews.

Durham *et al.*, (2008) recorded upper limb treatment sessions within as natural an environment as possible. Participants were able to view these recordings during subsequent semi-structured interviews in order to aid recall (although it is explained that clients were interviewed immediately after the treatment session and it is not clear from the paper to what extent the

recordings were required). Example questions are included in the paper and the slightly different focus taken with therapists and clients is accounted for within the research aim.

Data related to feedback, instructions and motivational statements were categorised from the video recordings and further grouped into internal focus, external focus or mixed focus of attention; themes were also drawn from the interview transcript and used to triangulate data. Authors discussed methods for ensuring rigour and the value of data triangulation. The results demonstrated that four of the six themes which emerged in interviews were also identified from video analysis, (methods of communication, attentional focus, goals and impact of presence of the camera).

This work demonstrates the value of small group research in initial exploratory studies, which supports the contribution of the current study (n=10) and that video recording provides valuable data to assist this process. The importance of both client and therapist's interviews to triangulate data about a shared experience is acknowledged as is the importance of familiarising participants to the presence of the recorder if the data is to be analysed as part of the study. This additionally supports the use of paired participants of client/ therapist which informed the structure of the current study.

Treatment sessions were observed by Wottrich (2008) and activities and discussions between therapist and patient were noted although video recording was not employed. Interviews were carried out within 3 days of the treatment; patient and therapist talked separately to the same researcher. Interview discussion included observations about how decisions were made and goals were set during the treatment session and features indicating a good and a problematic session were identified. Interviews were recorded, transcribed and themes extracted.

McGlinchey & Davenport, (2014) employed a focused ethnographic paradigm (seven therapists; four patients) to explore therapists' decision making about treatment on a rehabilitation stroke unit in the United Kingdom. Although client feedback was included the study was primarily aimed at identifying influences on therapists' decisions about treatment delivery. Therapists were purposively recruited to include a range of levels of experience from new graduates to individuals with post graduate practical and academic training at Master's level. A convenience group of client participants was drawn from those linked to the therapists. This study further supports the value in recruitment of therapists and clients who are known to one another.

McGlinchey & Davenport, (2014) did not employ videotaping but treatment and planning sessions were observed and used as a basis for questions during semi structured interviews. Physiotherapist interviews focused on the factors influencing the planning and delivery of physiotherapy. Client interviews focused on their perceptions of the physiotherapy they received. This provides support for differing aspects of discussion with clients and therapists within the methodology of the current study.

Data obtained from interview transcripts, scheduling meetings and Observational field notes were coded. The larger volume of interview data was analysed first; codes were combined to determine categories and these were compared with the smaller amount of observational data. Trustworthiness of the analysis process was enhanced through this triangulation, provision of an audit trail to explain coding decisions and participant checking of interview transcripts.

Thus existing work identified the value of effective communication between clients and therapists in order to clarify goals and support engagement, motivation and recovery. However, achieving this is challenging and increases the complexity of decision making during delivery of treatment. Further work is needed to explore this in all areas of practice.

Although existing literature related to combination of videotaped treatment sessions and semi structured interviews is sparse there is a small body of work which employed observation and interview to good effect in exploring similar practice based questions to this study. Video is useful in supporting memory and as a means of data verification if required. Especially valuable when the time available for data collection prevents the scheduling of several observational sessions in order to refine the subsequent interview questions.

Further, extant studies demonstrate differences in reports of clients and therapists about their inclusion in treatment decisions (Wottrich et al., 2004, Wain, Kneebone & Billings, 2008). This highlights the importance of including client's opinions in practice based research and this will be addressed in phase 3 of this study.

5.1.2 Client perspective about treatment decisions

5.2 Aims and Objectives

5.2.1 Phase 3 Summary

This phase generated narrative qualitative data in response to open questions collected via a discursive (minimally structured) interview. Prior to the interview, a video (visual and audio) recording was taken during a treatment session/therapeutic interaction between a physiotherapist and a client in order to identify and address movement dysfunction of the hemiplegic arm after stroke; this recording was viewed in its entirety by the participants during the interview. The content of the recording and specific events during the recording supported open questions/ free discussion about the therapeutic interaction and this was audio recorded.

Therapists and clients viewed the recordings independently of one another, their comments were recorded separately and content was not disclosed. Viewing order was defined by convenience for the participants and was not

consistent. The interviewer viewed the video recording prior to both interviews and was familiar with the content.

The interview explored therapists' and clients' thoughts and feelings during their viewing of the recorded interaction (assessment and treatment). This included comments related to their thoughts intentions and feelings during the interaction and subsequent comments /observations in response to viewing the recording. The recordings (initial video and subsequent interview) were taken in a small range of service settings: hospital based acute admission stroke ward, community based rehabilitation.

Data collected is descriptive; compiling presentation of qualitative data derived from thematic analysis of participant narrative. Themes were extracted from discussion of the therapeutic interaction via discursive (minimally structured) interviews; these themes were examined in order to describe and explore aspects of the therapeutic interaction from the perspective of the physiotherapist and the client.

Data provided by physiotherapists related to interpretation of the information derived during the interaction and its relationship to the subsequent actions. This included identifying key areas related to promoting/supporting recovering motor control for the identified client (in relation to specific movement, combinations of movements and functional movements) and the rationale underpinning the selection of content and mode of delivery of interventions intended to address those areas.

Data provided by clients related to their experiences of therapeutic interactions; this included thoughts and feelings about their movement problems, the therapeutic relationship and the content and delivery of the interventions.

5.2.2 Phase 3 Aims

To explore the process of selection and delivery of interventions to address movement dysfunction for the hemiplegic upper limb after stroke from the perspective of the client and the therapist.

5.2.3 Phase 3 Objectives

1. To explore the rationale which therapists employed in order to identify and understand key components related to movement of the hemiplegic arm after stroke during delivery of therapeutic intervention.
2. To explore the rationale which therapists employed in order to formulate decisions about treatment for the hemiplegic arm after stroke during delivery of therapeutic intervention.
3. To explore decisions in relation to selection and delivery of the therapeutic intervention from the perspective of the client.

5.3 Method

5.3.1 Study design

Design: Descriptive Qualitative approach based on semi structured interviews; open questions and reflective discussion. This approach aims to understand the complexity of human experiences through exploration of personal aspects of the experience (Burns & Grove, 2009).

5.3.1.1 Overview

Themes were derived from participant narrative collected via reflective discussion within an interview with physiotherapists and clients. Influences on the selection and aspects of delivery of a specific physiotherapy intervention for treatment addressing movement of the hemiplegic upper limb were explored. This was supported by concurrent viewing of a video

recording of the treatment session and narrative collected was therefore specific to that session.

Discussion was additionally supported by a schedule which identified areas from extant literature and/or had emerged during phases 1 and 2 of this study (Appendix xiii).

Purposive sampling was used to recruit five physiotherapists who were in current clinical practice treating stroke. Participants were drawn from a convenience sample of therapists working in the stroke service based at a Foundation Trust in the North East of England and a convenience sample of five clients who had recent stroke (less than 3 months) and who were currently working with physiotherapists to address movement of their hemiplegic upper limb. All clients had been admitted to hospital following stroke but treatment location related to patient centred care pathways and included acute wards and community based rehabilitation.

Physiotherapy Participants were drawn from NHS qualified staff grades 5 (physiotherapist) and 6 (specialist physiotherapist) and had a range of postgraduate experience in neurological rehabilitation for individuals who had sustained stroke. Participants were currently working with clients in the acute and sub-acute phases of stroke rehabilitation (based on ISWP: RCP: 2012 definitions). Clients had recent experience (less than three months) of stroke (for specific client inclusion/exclusion criteria please see section 5.3.5.2; Table 5.1).

5.3.2 Interview design

This study was exploratory in nature, interview questions for this phase were based on facilitating and supporting individual reflection related to the therapeutic interaction which ensured from viewing the videotaped treatment session.

The objective was to explore the experience of the therapeutic interaction from the perspective of the participants. It was anticipated that the information shared by clients and physiotherapists would differ. Therapists use reflective practice and discussion of their treatment experiences and clinical decisions as part of Continuing Professional Development and Lifelong learning it was anticipated that the videotape would permit reflection of this type; it was anticipated that this process would be enhanced by the facility to pause and rewind the tape to view and review client presentation, interaction and therapeutic outcome.

It was anticipated that client participants would have little or no experience of reflective narrative; but that they would be familiar with medical and physiotherapist examination and discussion about their experience of stroke. It was anticipated that their narrative would be from the perspective of "expert patient" but that if specific questions were used in order to request more information these would be of a type familiar to them from previous encounters with physiotherapists.

Because of ethical requirements and time limitation it was not possible to pilot the recording/discussion process however the intention and objectives were discussed with clinical physiotherapy colleagues (n=3) and a list of areas which might be explored was established (Appendix xiii). Feedback from this small group suggested that these were areas which frequently formed part of supervisory practice and were unlikely to cause distress. The main researcher has current experience in clinical practice which includes discussion with clients in setting goals, giving feedback about movement and requesting client opinion about aspects of treatment. Although a specific pilot study was not undertaken, the main researcher used this experience to reflect in advance of the data collection on the most effective and least distressing means of facilitating client discussion in order to collect relevant information.

5.3.3 Ethical approval

The Physiotherapists who consented to take part in this phase of the study worked in a Foundation Trust Hospital providing acute and rehabilitation services under the auspices of the UK: National Health Service for clients who had sustained stroke. The clients who consented to take part in this phase of the study were receiving medical care from the same Foundation Trust Hospital.

The individual therapeutic interaction which was recorded and provided the basis for the interviews from which data for this phase were derived represented routine clinical practice as part of the service for clients after stroke; the physiotherapy participants were bound by contractual terms, conditions of service (including current Criminal Record Bureau (CRB) status) and adherence to the standards of the Health and Care Professions Council. Video recordings and Interviews were conducted on Foundation Trust premises or the participants own home (dependent on the participant's request).

Ethical approval for this study was obtained from Northumbria University Research and Ethics Committee (28.11.11) and the Integrated Research Application System (City Road and Hampstead; Project number: 12/LO/0819: received 19.09.12) (Appendix ii). The Foundation Trust was included during all stages and ethical review included Site Specific approval, Foundation Trust Research and Development approval (03.04.13) and adherence to all requirements related to clinical research practice and Caldecott approval for the Foundation Trust (Appendix xiv).

Video recording took place during a routine clinical treatment for clients, the treatment delivered was aimed at the clients' clinical need and goals and the client was not disadvantaged in any way by this process. Ethical requirements were met at all stages of the study: informed consent was

obtained from clients and therapists to record the treatment session and to participate in an interview while viewing the video recording of the treatment. As part of the study participants were asked to review videotape in order to comment on the treatment from their perspective. The inclusion/exclusion criteria for clients screened for level of movement and emotional effect of the stroke. However, the possible impact of viewing the video and seeing their movement was discussed with the client (and their relatives if requested by the client) as part of obtaining consent to participate in order to ascertain that this would not be upsetting for the client. Tapes were reviewed by the main researcher in advance of the interview to check that content was unlikely to cause distress. Privacy during viewing and anonymity when results were presented was ensured.

Physiotherapists were offered the opportunity to view the video in advance of participating in the interview with the researcher and were assured that areas included in the discussion were at their discretion; once again privacy for viewing and anonymity when the results are reported were ensured. Videotapes were viewed only by the client, the physiotherapist and the researcher and were viewed only in a private room. Electronic data were password protected and stored with all hard data in a locked filing cabinet within a locked room; the researcher adhered to the university and clinical research standards.

5.3.4 Sample size

Sample size was limited by the use of theoretical and purposive sampling and recruitment from a defined group of physiotherapists and clients derived from a specific NHS Foundation Trust.

Interview based studies generate extensive material (Huberman & Miles, 2002; Alreck & Settle 2004, Saldana, 2009) and on discussion with research supervisors and associates it was anticipated that because the questions were about specific aspects of clinical practice it was acceptable to recruit a

small group of participants (n=10) and to monitor the interview responses for "saturation" of emerging data. This was in accord with the size of participant groups in similar studies (Durham *et al*, 2008; McGlinchey & Davenport, 2014; Wain, Kneebone & Billings 2008; Wottrich *et al*., 2004)

5.3.5 Recruitment

5.3.5.1 Physiotherapists

Recruitment of physiotherapists for phase 3 (n=5) was purposive; all participants worked in acute or rehabilitation for clients after stroke for an NHS Foundation Trust in the North East of England and were known to the lead researcher. This selection bias of a subgroup from a specific group of physiotherapists working in neurology may have impacted on the range and transferability of the data collected (Edwards *et al*., 2004; Larsson & Gard, 2006; Plummer *et al*., 2006).

Potential physiotherapy participants were contacted by email and information about phase 3 (physiotherapist participant letter and information sheet; see Appendix xv) was provided. Potential participants were asked to contact the researcher by email or telephone if they were interested in order to arrange a convenient time to discuss the study further. In total 8 potential participants were contacted and all indicated their interest in further participation; final recruitment was limited to physiotherapists who were working with clients who had recently experienced stroke during the period available for data collection. Potential physiotherapy participants were reassured of confidentiality, that they could withdraw consent at any time and that all data relating to them would be destroyed.

5.3.5.2 Clients

Potential client participants (those who met the inclusion/exclusion criteria; (Table 5.1) were identified by participating physiotherapists; the client's

Inclusion criteria	Exclusion criteria
CVA in past 12 months	CVA more than 12 months previously
Upper limb score less than 56/57 on the Action Research Arm Test) (see Hsieh *et al*.,1998 for validity); (Note: score for most severe functional loss is 57/57).	CVA not involving upper limb or involved to degree where rehabilitation not aimed at recovery of some movement)/ function
Having treatment directed at rehabilitation of affected upper limb	Treatment not aimed at affected upper limb recovery (e.g. treatment only as part of recovery of balance)
	Significant sensory /proprioceptive loss of affected upper limb
Able to give informed verbal or written consent	Not able to give informed verbal or written consent
Able to express verbally in order to participate in interviews/ video analysis	Unable to express verbally in order to participate in interviews/ video analysis
No visual problems (hemianopia), able to interpret visual information/video	Visual problems (hemianopia), unable to interpret visual information/video
No emotional vulnerability; able to tolerate watching video	Emotional vulnerability; unable to tolerate watching video
Age appropriate function of upper limb prior to stroke	Reduced function of upper limb prior to stroke

Table 5.1 Client inclusion and exclusion factors (based on Donaldson, Tallis & Pomeroy, 2009).

medical notes were checked by the lead researcher and potential recruitment discussed with the Medical consultant overseeing the care of individual clients'. This ensured that there was medical, MDT and physiotherapeutic accord that the inclusion/exclusion criteria were met and that consideration of clients' wellbeing had been overtly addressed. The Research Department for

the Foundation Trust was contacted by the lead researcher in order to comply with Trust Policy and Best Practice and to ensure that clients who had already consented to other trials were not approached. Potential client participants were approached informally by physiotherapists known to the client; those who indicated that they would like to have further information were contacted by the lead researcher in order to provide information sheets giving details about the study (client participant letter and information sheet: Appendix xvi). These were left with the client with contact details for the lead researcher; clients were assured that there would be no further contact if they did not wish to take part in the study and that this would have no effect on their treatment.

In total six potential participants indicated their interest in further participation and were contacted by the lead researcher; one potential participant did not wish to participate after hearing more about what would be required. Potential client participants were reassured of confidentiality, that they could withdraw consent to participate at any time without being asked for a reason or having any effect on their treatment and that if they indicated that they withdrew their consent all data relating to them would be destroyed.

5.3.5.3 All Participants

Final recruitment was of five pairs of participants (client: physiotherapist) who were known to one another and had already worked together on at least one occasion prior to the initial video recording. Data collection (video and interview recording) for four pairs took place on NHS Foundation Trust premises; one pair was recorded in the client's own home. Interviews with four of the clients and two of the physiotherapists took place on Foundation Trust premises; one of the clients and three of the physiotherapists viewed the data in their own homes (one client's wife was present during collection and viewing of the data; she did not view the tape herself although she made general comments during the interview; these have not been included in the data analysis: A physiotherapy assistant was present for part of the

treatment session; she gave written consent to be included in the video recording but did not participate in viewing or discussion of the data).

Further verbal consent was given at the beginning of each interview. Participants were assured of anonymity and transcriptions were returned to each participant to edit, amend and expand further in order to ensure their discussion with the researcher accurately represented the information which they wished to convey.

5.3.6 Veracity

Veracity was established by review of the draft version of the interview schedule by Chartered physiotherapists (n=3) with clinical experience of physiotherapy practice in neurology and amendment of the schedule in response to their comments. Physiotherapy participants were recruited from a group with specific knowledge of the topic being investigated (experience in delivering a physiotherapeutic intervention for stroke rehabilitation). Client participants had experiential knowledge of the effect of stroke and previous experience of physiotherapy to address upper limb movement.

However, the participant group (therapists and clients) was limited to a single NHS foundation trust in the North East of England, the primary researcher was known to the therapists in a senior clinical capacity and this may have influenced recruitment through perceived coercion or intent to support (see: McGlinchey & Davenport, 2014). Selection bias of a subgroup from a specific group of physiotherapists working in neurology may have impacted on the range and transferability of the data collected (Edwards *et al*., 2004; Larsson & Gard, 2006; Plummer *et al*., 2006).

Although participant clients had not been treated by the researcher and were not involved in any other research studies, the partner NHS Foundation Trust has a commitment to research and participants may have been aware of other trials taking place and (despite re-assurance) perceived the value

placed by the Trust on research involvement; participation may have been considered a means of repaying the care they had received.

5.3.7 Interview Consistency (Neutrality)

The interview comprised narrative within which participants were asked to reflect on and discuss their approach to treatment of the hemiplegic upper limb for an individual client. This discourse was based on a videotape of a single intervention between the participant and a “paired” client. Thus interventions were unique to each client /therapist pair: although the areas discussed were broadly similar in each interview the content and format varied. This reduces consistency of the data collected because the “perspective” from which each respondent approached their reflection may have varied and the contribution of the interviewer was difficult to standardise and may have unwittingly influenced the responses of the participants and the direction of the discussion (Ritchie & Lewis, 2003; Alreck & Settle, 2004; Silverman, 2011).

Physiotherapy and client participants were aware of the objective of the discussion as this was included in the consent material. There was a short gap between recording and viewing the videotape; although participants did not view the tape prior to the interview, they had by definition been present during the treatment session and thus had time to reflect in advance on their answers.

Physiotherapists are familiar with case based discussion within practice and as part of Continuing Professional Development; this is usually undertaken in a familiar environment and with colleagues. Information regarding the objectives and themes of the discussion was provided in advance in order to reassure potential participants that the method of data collection was “informal and non-threatening”. The wish to provide reassurance may have impacted on the interaction between the participant and the interviewer and influenced the direction of the narrative. All physiotherapist participants were known to the interviewer; this may have made discussion easier with these

participants and/or may have influenced the narrative as they may have felt greater “pressure” to provide “right” responses.

Client participants had no previous experience of discussion of their treatment other than goal setting. All had used a mirror during grooming activities of daily living but this was the first occasion following their stroke that they had consciously observed the effect on their appearance and movement. Ensuring that this caused the least possible trauma was embedded within the selection criteria and protocol.

The code of practice within the partner NHS Foundation Trust is to deliver “client based care”, this is in line with physiotherapy code of conduct and participating clients were familiar with discussions regarding goal setting, progression and expectations following discharge and with discussion about their treatment during physiotherapy sessions. Care was taken by the lead researcher to put the client at their ease and to discuss topics in a sensitive manner consistent with best practice; clients were aware that the study was exploratory and that their observation about how they experienced physiotherapy was valued. However, it is possible that clients felt loyalty to the participating therapists and deliberately posed their responses in positive terms. The interview was based on the video which permitted discussion regarding specific events during the treatment session; the researcher was thus able to ensure the interview explored the experience and remained as impartial as possible with respect to the therapist.

All clients were able to express themselves verbally however some were naturally more voluble than others; the degree of “prompting” and direct questioning varied. The interview transcripts include the words of both participants and analysis (undertaken by the researcher) accounted for responses which may have been elicited as a consequence of prompting. Transcripts were checked and amended by all participants prior to analysis which increases both veracity and consistency as participants were able to explain and expand on their comments.

5.3.8 Data collection procedures

5.3.8.1 Video protocol

During filming of the therapeutic interaction the researcher, the client and the physiotherapist were alone in a designated physiotherapy treatment room at the Foundation Trust. It was not possible to lock the door but the door was closed, the treatment area was screened and a notice was placed requesting other staff members not to enter; despite this on two occasions there were interruptions. Although the room was entered the screens remained in place and there was no violation of confidentiality or privacy.

Recording for one client was in his own home and he and the participant physiotherapist (and physiotherapy assistant) consented for his wife to be present throughout although she did not take part in any aspect of the treatment (this was normal practice during his treatment sessions).
The video recording was transferred onto a data storage unit which was separate from but could be used with the researchers own (pass word protected) lap top computer; this storage unit was kept in a locked filing cabinet in a locked room at the University of Northumbria except for viewing by the participants.

5.3.8.2. Interview protocol

During viewing of the video data of the therapeutic interaction and audio recording of the interview, the researcher and the participant (the client or the physiotherapist) were alone in a designated private room at the Foundation Trust or alone in a room in the participants own home; the outer door was closed and locked in both locations and un-authorised access was not possible.

One client was interviewed in his own home; he and the participant physiotherapist (and physiotherapy assistant) consented for his wife to be

present (she had been present during the initial video recording). She did not view the video recording and made only general comments; these were included on the transcription but have not contributed to the data analysis. Interviews were recorded using a digital recording device placed adjacent to the computer; thus the recorder picked up both the spoken interview and the audio link to the section of the tape being viewed; these were included on the transcription and facilitated location during analysis of the area of the video recording being viewed.

Participants were aware of the overall aims of the interview (this was included in the participant information sheet) and the general areas of physiotherapy practice which might be discussed (information provided when arranging appointment time) but were not given specific questions to consider in advance of the interview. However, participants were assured prior to giving consent that the interview was informal and discursive and that although the researcher would “guide” the participant in order to ensure consistency of the areas discussed with all participants the content and depth of disclosure would be determined by the participant. Participants were also assured that there would not be discussion of areas which they felt uncomfortable about and that the final transcript would be provided for the participant to edit prior to thematic analysis. Participants were further assured that they could terminate the interview and withdraw their consent at any point.

The interview comprised narrative within which participants viewed the recording of the interaction and were asked to reflect on and discuss their thoughts and approach to assessment and treatment of the client’s hemiplegic upper limb after stroke; this discourse was supported and illustrated by examples drawn from the recording (Appendix xvii).

The researcher had viewed the recording in advance and noted the content of the intervention so that specific areas could be selected; however, all participants (client and therapist) engaged completely and viewed the

recording it in its entirety. The researcher had an outline of areas to cover in the interview (Appendix xiii) however the order and time spent varied between participants: some gave more detailed information than others. As the interview progressed participants became more relaxed and further relevant information was often shared.

5.3.9 Data transcription

In order to meet the time limit on this phase of the research assistance was sought with transcribing the interview recordings. This was done by a Doctoral student from another faculty in Northumbria University. This individual does not have a medical background and has no connection with any local hospital but had transcribed interviews for phase 2 of this study and material for other heath related research projects (at Northumbria and other universities) and was aware of issues related to confidentiality.

The participants for phase 3 were recruited from an NHS Foundation Trust Hospital and were not known to the transcriber. Participants were addressed by their first names only throughout the interview and other than the 'matched' client/physiotherapist there was no mention of another individual, hospital or health provider by name; it would not have been possible for the transcriber to identify the participant from the information on the audiotape. Method for transcription and verifying accuracy of the transcription is reported in section 4.4.2

5.4 Data Analysis

5.4.1 Method

The method employed for analysing data in phase 3 of this study was identical to that employed in phase 2 and has been reported in section 4.4.3

Interviews took place during June/ July 2013. The researcher reflected after each interview about her “technique” but no attempt was made to formally analyse the data collected until the collection process was completed. Tapes were checked for audibility and sent in sequence to the transcriber. The researcher became familiar with the themes which emerged during the interviews and was aware of the “re-occurrence” of areas during discussion. Prior to completion of data collection from all ten participants it was apparent that the information collected was reinforcing and confirming the content of earlier interviews and that saturation had been reached.

Therapist participants were all known personally to the researcher. Despite reassurance and attempts to limit the potential effect on validity and reliability, this must be considered. McGlinchey & Davenport (2014) identify this as a potential difficulty for pilot/ small scale exploratory studies of clinical practice and emphasize the importance of the reflective/reflexive process. Additionally, my role as a clinician provided an “insider” role which has potential to affect both data collection and data analysis (Cresswell, 2009). It is possible that my position as a “neuro-physiotherapy insider” may have created an understanding and empathy between participants and researcher and encouraged more honest and open discussion and disclosure than would have otherwise occurred and improved the specificity of the data collected.

My role as a senior staff member may have affected data collection with therapy participant who wished to give information which they felt was “correct” or to suggest a thought process which was more detailed than was actually the case. My postgraduate “clinical training” has included attendance of several advanced level Bobath concept training. Therapy participants were aware of this and those who had also attended Bobath concept courses may have felt more comfortable in discussing their rationale with me.
During study at master’s level in neurological rehabilitation and in my role as a senior lecturer I have reviewed information relevant to other treatment approaches. Although I feel that this has been imported into my clinical

practice and influences my clinical and academic teaching I am aware that I employ propositional knowledge of movement control and “facilitation/ handling” techniques consistent with the Bobath concept within my own practice, even when teaching or guiding what would also be considered specific exercise or repeated task specific practice.

Although I did not participate in treatment of client participants during the period of collection and analysis of the data they were aware of my role on the ward. It was emphasised that the data collection was part of a “joint exploratory study” for client, therapist and researcher a power imbalance and a wish to please me and to defend the practice of the therapist participants may still have ensued.

My personal relationship with both therapy and client participants may have affected the interpretation of the data. These issues are discussed as part of reflexivity in Chapter 2.

This background juxtaposed with limited experience in coding and interpreting qualitative data had potential to cause “researcher bias” during analysis. Additionally, my experience of making clinical decisions within the same area of practice as those discussed with therapy and client participants might affect my interpretation. In order to reduce this possibility a decision was made (after consulting relevant texts and discussion with peers who had experience with qualitative analysis) that I should follow the approach suggested by Lincoln & Guba (1985); and stay close to the words of the original texts in order to reduce the possibility of moving to “observer generated/ interpretive coding” too early in the iterative process (see Sim and Wright, 2000; Denzin & Lincoln 2005, Saldana, 2009).

5.4.2 Thematic analysis

This was informed by Gamble (2013); Moule *et al*, (2011); Huberman and Miles (2002); Saldana (2009). The stages followed match those employed in

phase 2 of this study and are presented in section 4.4.3. Examples of this process are provided in Appendix xviii

5.5 Results

5.5.1 Participants

5.5.1.1. Physiotherapists

Relevant characteristics for physiotherapist participants are detailed in Table 5.2 below, Pseudonym's have been used in order to protect participant's identity and these will be used during presentation of results and discussion.

Pseudonym	**Gender**	**Age**	**Training**	**Experience in treating stroke**
Ellen	F	20-25	BSc Physiotherapy	Less than 2 years
James	M	25-30	Pre-registration MSc Physiotherapy	Less than 2 years
Rachel	F	25-30	BSc Physiotherapy, Basic Bobath Course	5-10 years
Vicky	F	25-30	BSc, Advanced Bobath Course	5-10 years
Kath	F	25-30	Pre-registration MSc Physiotherapy	2-5 years

Table 5.2 Characteristics of physiotherapist participants

5.5.1.2. Clients

Relevant characteristics for client participants are detailed in Table 5.3 below, Pseudonyms have been used in order to protect participant's identity and these will be used during presentation of results and discussion.

Code	Gender	Age	Hemiplegia
Mark	M	40-45	Right
Dorothy	F	60+	Right
Jean	F	60+	Right
Joe	M	60+	Left
Ron	M	60+	Right

Table 5.3 Characteristics of client participants

5.5.2 Physiotherapist themes

The participant therapist and client pairs had worked together prior to the session which was recorded, thus this session recorded was one in a series. Three major themes emerged from analysis of data derived from the interview with the physiotherapist participants: discussion of structure of the treatment session, rationale for interventions provided during the session and description of collaborative interaction between the therapist and the client.

Three themes were extracted; theme 1 (structure of the treatment session) and theme 2 (treatment rationale) are presented below. Theme 3 (collaboration) is presented in association with a linked "client theme" in section 5.5.4

5.5.2.1 Theme one: Structure of the treatment session

This theme explored factors which influenced the session content or delivery of the treatment in order to identify or achievement the objective. Factors which participants described were:

a. Previous experiences of working with the client.
b. Intentional re-assessment or alteration (in content or delivery) in response to changes in the client's movement control during the treatment.
c. Experiential learning.

5.5.2.1a Previous experience of working with the client

The service from which participants were recruited discussed and updated client goals at bi-weekly multi-disciplinary team meetings; clients were not formally involved in these meetings although goals to be addressed with the team had been discussed and agreed with clients. Participants reported linking goals worked on during individual treatment sessions with overarching goals which were part of MDT working. Interventions employed during the session were aimed both at improving the movement components required for overall function and practise of specific tasks.

> "We set goals for the MDT but the team doesn't want to know that I want the patient to be able to gain full extension at the elbow and have some wrist activity. They want to know can the patient give themselves a drink" (Rachel: 15).

However, in addition to this, specific goals sometimes developed from comments made by clients during the session. For example, at the outset of the treatment session one participant client described his frustration that he was unable to clean his teeth effectively. The therapist used this goal as a basis for the session and analysed his movement control in relation to that task.

> "He was able to take his hand up to his mouth and maintain that position for a little while. But his elbow dropped which made me think there was some instability at the shoulder. He said that he was having trouble with cleaning up and down, rather than across; it wasn't coordination but strength" (Kath: 9)

Therapist participants expressed that treatment content and delivery was informed by their prior knowledge of the client's presentation. This included control of movement and sensation but also other factors related to engaging with treatment for example, cognition and concentration.

> "Because I'd seen "Jean" before this, I knew that her trunk control and her posture wasn't great, so I knew that she needed lots of help and verbal prompts with that" (Ellen: 3).

> "I knew from previous sessions he was cognitively very good, he follows instructions and he's able to concentrate on things so you can give him fine details" (Kath: 45).

Prior awareness also informed therapist's knowledge of areas which should be addressed as part of treatment. Thus knowledge of the client's level of motor control influenced the level of movement complexity attempted during the intervention, or the amount of physical support provided.

> "His shoulder blade doesn't move a great deal. So I needed to mobilise his shoulder blade first to then access some muscular movement" (Vicky: 11).

> "I know what she's like in her trunk, and I know that she hasn't got stability there, which is why she needed the assistance from me. So I was thinking, "Right, we need to work on this to see if we can get some stability before we can go on any further" (Rachel: 20/21).

There was variation regarding planning of session structure, which seemed to relate to experience. Less experienced therapists reported that they considered the interventions which would be used and possibly even the order in which they may do this in advance of the session. It was not apparent from the interview responses if therapists deviated from this plan during the actual session.

> "I'd seen her the day before, so I'd had a gross idea of what I wanted to do. I did think out in what sequence I would do things but not a specific plan of exercises" (Ellen: 41-43).

Experienced therapists were more flexible about the content and structure and reported responding to changes in client movement between sessions and during treatment delivery.

> "I hadn't seen Dorothy for a little while, so I thought I would just check range of movement and actually see what activity she did have so that I could start and plan what I was going to do with her" (Rachel: 2/3).

Sessions were not considered in isolation; activities from one session were adapted or developed further in another session. The degree to which therapists planned future interventions varied, this related to the individual therapist and was based on the response of the client during treatment. In the example below James who is less experienced described responding in a subsequent session to a problem observed previously. In contrast Rachel who has more experience reported that she linked sessions together.

> "This was driven by my previous treatment of Alan when I tried to use holding his glasses and that was too hard for him. So I was looking for something bigger and simpler to grasp. That was why I selected the glasses case" (James: 81).

> "In my head, even when I was doing this, I was thinking about the next session that Dorothy would do as well. Trying to lead on to what I wanted to put in her next treatment" (Rachel: 58).

5.5.2.1b Intentional re-assessment or alteration (in content or delivery) in response to changes in the client's movement control during the treatment

Although therapists had previous experience of treating the clients they re-examined the clients' movement in order to initiate treatment, transition from intervention to another, or to alter a facet of the treatment delivery.

> "She had really good activity and I thought, "I'm going to see what she can do." Because I was thinking of functional reaching and grasping, and I want to know whether she's going to have what she needs to be able to take a drink, to be able to pick up the cup and release it" (Kath: 7-9).

Less experienced therapists were more likely to stop in order to re-establish their knowledge about the relevant feature of the client's movement at

intervals throughout the session; this is demonstrated in treatment documentations (Appendix xvii).

> "There were times when I had to stop and think, "What am I going to do next? What makes sense to do next?" It wasn't thinking, this is the natural progression because I don't think my brain moves that fast" (Ellen: 46).

More experienced therapists described their awareness of changes in movement during execution and had more ability to compare and evaluate features of motor control during the interventions. Features of the treatment were altered in response to changes in the client's movement during delivery of the intervention.

> "Dorothy kept throwing little things in herself so I went with what she was doing. I just followed what she was giving me. There wasn't particularly a plan, it was kind of just changing as Dorothy changed" (Rachel: 33).

Although experienced therapists reported stopping less frequently they still needed to overtly re-examine and consciously re-evaluate on occasions. Treatment changes participants reported included altering the client or therapist's position or changing aspects of the environment. Rationale supporting specific decisions about interventions is explored further in theme two.

> "I knew that I wasn't getting very good extension at the trunk. I wanted to lift the trunk up to get a good reach but I realised that a long lever was a mistake. I should have given him more support; his scapula couldn't support the weight of his arm" (Kath: 65).

> "Then my thoughts were, "right, we've achieved what we needed to achieve here. Now I need 'Joe' to see if he can get some active, forward flexion while he's got some stability in his scapula" (Vicky: 47).

Therapists identified their intention was to adapt treatment to increase or decrease the complexity of the movement being performed by the client. This theme links with that explored in "treatment rationale" and included changes in the environment or equipment or alteration of the client's and therapist's body position and placement of the therapist's hands.

> “I’m looking to see what arm movement he’s got; he didn’t have any forward flexion of his shoulder it just came from his elbow. I took him over to the table to look at a different position to treat him in, so I could try and access some shoulder flexion” (Vicky: 5/6).

> “We’d introduced a table and ‘Dorothy’ hadn’t had to negotiate that height previously. She needed to get the elevation and hand position to be able to clear that. I felt that I could really control her whole upper limb and her trunk through handling biceps and triceps.” (Rachel: 64-67).

> “I’m trying to make that a harder task for him, to see if he can control the arm to pick it up. I had made it easier by bringing the object back in so he doesn’t have to reach quite as far” (James: 88).

Despite this even experienced practitioners described occasions when they had difficulty determining what was preventing achievement of their objective. This stimulated discussion with the client (this is explored further in theme 3; collaboration).

> “I always check with them, they can give you more information than you can see yourself on how things feel, so you need feedback off the patients as well” (Kath: 161).

5.5.2.1c Experiential learning

Therapists reported varying levels of confidence in their ability to analyse and influence the movement control required by the client during treatment. Therapists considered that this required skill and experience and the structure and content of the session was based in part on the therapist’s belief in their ability to do this.

> “I have to admit I’ve specialised in neuro for many years now, but I think it’s taken me a long time to realise how light you can be with patients in terms of your facilitation” (Rachel:70).

> “I was struggling to move it a little bit, at times. I didn't know whether that was just that I wasn't getting it right, or that it was, just stiffness.

> Was I in the right places to get the best movement from him, like, my hand on the right anatomical structures" (Kath 154/155).

Therapists considered the theoretical knowledge and physical coordination which underpinned this ability difficult to learn from books. They reported that physiotherapy treatment skills were developed through experience of working with other clients or learned from other (more experienced) staff members. This was either as part of normal collaborative practice, in service training or during specific postgraduate courses.

> "I don't think a lot of my knowledge comes from things that I have read. I think you learn more with experience and working with other people. The books don't explain things; it's all about specifics like anatomy. It doesn't actually give you a step-by-step guide of how you should do things (Kath: 96/97).

> "That technique was definitely a Bobath technique; yes, Advanced Bobath course" (Vicky: 86).

Therapists also articulated how their treatment had been informed by information and treatment skills derived from working in other areas of physiotherapy for example the effect of musculoskeletal practice on their knowledge of joint alignment and skills of mobilisation.

> "When you're doing outpatients you are always told that you need a better posture to be able to gain full range of movement of the shoulder. So I don't know whether I've picked it up from there or just generally through neuro. It's thinking about background knowledge of the structures not neuro specific, its movements related" (Kath: 19/20).

5.5.2.2 Theme two: Treatment rationale

This theme described the therapists' reason for selecting or altering delivery of a specific intervention. The areas which were generally considered were:

a. Addressing specific features of movement
b. Increasing sensation
c. Working for activity/function

5.5.2.2a Addressing specific features of movement

Therapists described working with clients to address altered movements secondary to stroke. This included increasing control of the stability and mobility of areas which they considered necessary for movement of the upper limb. This included increasing clients' postural control of the position of the trunk and pelvis to increase symmetry of weight bearing and improve components of reaching affected by stability, balance and dynamic movement of the trunk. Treatment also included improving alignment or increasing range of movement and coordination of all upper limb joints (including the scapula/thoracic articulation and the hand).

> "I'm looking at the position of his scapula and where it is in relation to his spine. Because postural stability is important for arm movement, so I guess the reason why I got him into forward lean sitting was so I could concentrate more on the specific muscles around his shoulder and scapula" (Vicky: 2/3/8).

> "I was thinking that she's flexed in her trunk, and I know that she hasn't got stability there. I was looking at that and thinking, "Right, we need to work on this before we can go on any further, to see if we can get some of that stability and more control in the arm, now that she has got that in her hand" (Rachel: 20 -22).

Treatments which were selected included those to increase soft tissue pliability and length, to mobilise areas which were limiting joint range and to activate muscle contraction.

> "He was quite stiff in his rhomboids; he needed to get length first before we then got any active retraction. So I'm mobilising the rhomboids then I'm getting him to try and access his lower Trapezius" (Vicky: 33/34).

Therapists also described treatment to address the kinematics of the client's movement; this was described as "movement pattern" and "movement control" and included joint angle, muscle firing sequence, speed, power, endurance and coordination.

> “I'm pushing with my thumb to give him the feedback of which way he needed to move but also getting him to push on to my finger. I'm resisting that part and then pushing to just give him a little bit of feedback of what I want him to do. And then after he'd got it, I didn't need to do it anymore” (Kath: 55/56).

> “I didn’t want him to go into any more internal rotation. I wanted him to think about his thumb so the idea of his thumb moving forwards would hopefully access his triceps to create elbow extension and then forward flexion of his shoulder (Vicky: 57).

The interventions and the supporting rationale described by participants varied in complexity. More experienced participants linked several smaller components into composite movements; this required the client to execute movements in a sequence or in combination with one another. Although two of these therapists also had advanced level training in the Bobath concept; a third who described treatment in a similar way was less experienced and did not have external postgraduate training.

> “I’m mobilising his fingers and his thumb and his wrist into extension, to activate his elbow extension and forward flexion of his arm. Then giving him sensory input through his hand to reach and push. What I wanted him to feel is that the initiation is from his hand not his scapula and shoulder. If you’re giving his hand more sensory input, then, in turn, his hand may start to become active. (Vicky: 105-108)

Less experienced participants more commonly treated components individually.

> “I’m looking at anatomical movements. The glenohumeral joint and elbow, looking at range in terms of short lever and long lever and quality in terms of how jerky the movement is and how well stabilised the shoulder is” (James: 12).

Therapists also described different methods of evaluation of movement control Differences were apparent but influencing factors difficult to isolate; experienced participants were more likely to give detail based on touch and a “kinaesthetic (hands on)” approach. The comment below was made by the physiotherapist with the least experience in neurological treatment demonstrates a biomechanical focus.

> “I’m looking at grasp and release of grasp and wrist extension, because wrist extension is very important in a strong grip. It wouldn’t be neurological specifically, definitely biomechanical. I’m trying to get him to isolate the hand movements; I think in my neurological training; we were trained about making a movement simpler by taking out degrees of freedom” (James: 27/29).

Some participants described the reasoning underpinning the position in which they placed their hands in detail. Examples included taking some of the weight of the underactive limb to reduce the level of muscle contraction required by the client in order to move that limb, counteracting displacement during movement by providing counter pressure around a joint at a specific angle in order to improve joint stability and movement efficiency and providing specific sensory cues either prior to or during movement which they intended to mimic or exaggerate those which they considered would be experienced as part of “normal activation”.

> “If the arm was too heavy that's going to inhibit the muscle activity around the scapula. Because it will be pulling it down, rather than letting it retract” (Kath: 32).

> “Feeling tonal changes, behind the elbow and proximal humerus, she did get some increased tone with any stresses. So by trying to take the weight off the arm I wanted her to engage in the activity, because she did have active abduction, but she didn't have enough power to achieve it herself. (Ellen: 5/6).

5.5.2.2b Increasing sensation

All participants discussed the rationale for treating sensory awareness to improve movement. Treatments varied, direct stimulation through touch independently of movement was used for example in order to orientate the client to awareness of the arm. Therapists also described treatment to increase kinaesthetic sensation during movement. Touch and passive or active assisted movement was used to stimulate feedback from joint capsule, muscle stretch and skin receptors to allow clients to experience sensations they could not have otherwise.

> "I wanted 'Jean' to get visual feedback of what she was feeling, so that she has two, sources of information "This is what that feels like, and I can see that sensation". There will be lots of things in her environment that, she's going to have to touch. So I want to vary the objects to do the sensory work with" (Ellen: 1:10/16)

> "I was trying to achieve some repetition just there, it's not task-orientated I'm just doing it to try and get some repetition of the movement. I'm trying to get her to feel, repeatedly, what I'm doing so that she knows what abduction feels like" (Ellen 2: 2-4).

Other participants, especially those with greater experience provided more detailed description and rationale of using sensory feedback to guide client's awareness of how to execute a specific movement.

> "He started to come into a slight elevation there. I just wanted him to stick with the lower trapezius. So I gave him lots of sensory input through his right, compared to his left" (Vicky: 87/89).

> "I'm pushing with my thumb to give him the feedback of which way he needed to go" (Kath: 55).

5.5.2.2c Working for activity/function

Participants described that they considered it important to work on movement which could be used to achieve daily activities. Helping a client to regain all or part of a movement which would allow achievement of independence was considered an important therapy objective. Therapists also considered that this contributed to client well-being and morale and that it demonstrated to clients that therapy had a purpose in helping them to regain some control over their own life. Work on entire tasks or their component parts was included within treatment by all therapy participants.

> "I often think by the end of my session, "Is there something functional that I can include?" I know that it's the functional things that patients take away from the session more than how high they can lift their arm. It's whether they could pick something up" (Rachel: 10/11).

> “So my thought process is very functionally driven for the patient. Wanting Mark to be able to return to the tasks he wants to be able to complete” (James: 27)

Therapists assessed when and how to include functional tasks because these required the client to have some control of all parts of the kinetic chain.

> “And then I thought, “If I’m happy in terms of her trunk and how she’s managing with her elbow extension, I would then come in and be more specific with the wrist and her hand.” Because I knew that it was the grasp and release that she was having more of the problem with” (Rachel:

> “My thought process is very functional in terms of what the hand can achieve, but I’m also very aware that if you’re sitting in a chair or reaching for anything, you need the stability of the shoulder” (James: 26).

When possible therapists described identifying movement which clients would be able to continue to practise independently or as part of everyday tasks. There was accord in encouraging movement during therapy which would help increase a client’s function through more efficient and natural movement patterns.

> “Because it was almost, like, a bit patient-oriented then physio-orientated then back to patient, so that she stayed engaged in the session. Because, I want her to go away from this and try and practise doing things” (Rachel: 53)

> “He's ready for function, ready to pick up a cup. I think he had his hands a little bit flexed and he was trying it like that but I don't want him to work like that. I wanted to make sure that he was able to maintain extension with his hand as he was bringing the wrist to make it sure that it's not going into a pattern” (Kath: 107-112).

5.5.3 Client' themes

Data related to clients' overall experience of the session, physical and sensory awareness during treatment and observations regarding collaborative interaction with the therapist. Three themes emerged from analysis of client data: theme 1: client observations about treatment, theme 2: client physical awareness and theme 3: collaboration. Client Themes 1 and 2 are presented below. Theme 3 is presented in association with a linked "physiotherapist theme" in section 5.5.4

5.5.3.1. Theme 1: Client' observations about treatment

This theme considers the experience of treatment from the clients' viewpoint:

a. Effort
b. Satisfaction
c. Effect of therapist's hand and body position
d. Function

5.5.3.1a. Effort

Several participant clients explained that they found physiotherapy hard work; they felt challenged by what they were asked to do during treatment sessions and were tired at the end. Comments included difficulty stabilising the weight of the hemiplegic arm, especially when it was extended and the challenge of controlling speed of movement.

> "I remember thinking I was it a little bit hard. Trying to keep my arm straight, it does make you ache a bit" (Dorothy: 8).
>
> "It looks as though you were finding it quite easy?" (Researcher: 35)
> "Not really, I was trying to stop my arm, just dropping. I was trying to control my speed and my strength in my arm. Instead of just letting it flop, I was trying to do it slowly" (Mark: 35/36).

However, although participants observed that regaining movement was difficult they did not express desire that treatment should be made easier. This is exemplified in the pleasure with which one participant described rising

to the challenge of building a tower with toy bricks and seeing her arm muscles working when viewing the video recording.

> “I didn't think I would be able to do it, it’s quite sturdy, as well, the building you know. You can see the muscles in my arm as well?” (Dorothy: 182-186).

Participants additionally reported that treatment required concentration and focus; one person also observed that she had an internal drive to push herself as far as she could manage. This was partly for her satisfaction but she also explained that she wanted to demonstrate her success to the therapist. This observation wasn’t explored further by the interviewer so it isn’t apparent if this was to demonstrate her commitment to the therapy process or because she felt that the therapist would share enjoyment of her success.

> “I wanted to push myself as far as I could have done, I want to show that I can do it, and show Rachel that I could do it as well” (Dorothy: 194-196)

5.5.3.1b Satisfaction

Clients’ reported satisfaction with the results of physiotherapy, comments were not specific but terms employed with regard to effect on movement were positive and included “better”, “easier” and “freer”.

> “It just felt a long way better, when I went back to the room I felt my arm would move” (Ron: 112).

Comments about the content of the session suggested that participants enjoyed having variety in their therapy. One participant described great pleasure from not knowing what movement and activities he would be asked to do during his therapy.

> “I don’t know what she’s going to do next. No two sessions are the same. She takes me by surprise, says I’m going to do this. And we’ll say, “Oh, right. Fair enough. We’ll do that then.” (Joe: 50 /51).

However, clients also reported that that they found instructions about exercise or movements difficult to remember when the therapists weren’t there. One client reported that he would like longer therapy sessions or more time with therapists in order to discuss his recovery and ideas for areas he could work on independently. He reported that he tried to use his arm as part of function but was not confident that he was “doing the right thing”.

> “Do you try and remember what people have said to you in therapy and then use it yourself?” (Researcher: 55).
> “Sometimes, yes”. But not all the time because there's that many things to remember (Dorothy: 55).

> “I would like more therapy and time talking to therapists that would be better, more time with James or with somebody else” (Mark: 127/128).

5.5.3.1c Effect of therapist’s hand and body position

Clients’ varied in their awareness of specificity in the position selected by therapists for their hand placement although this did not seem to be related to client’s individual levels of sensory awareness and recovery. Both participants commenting below had similar levels of recovery and sensation, although Ron was working with a more experienced therapist, and he reported that he felt the position of the therapist hands made his movement feel easier.

> “Do you find it easier when James puts his hands on and guides you, or do you prefer to be left to find things for yourself? (Researcher: 5)
> Well, sometimes I can’t understand what he wanted me to do. Like, he wanted me to do that, and swing it all the way round. I wasn’t so sure what he meant” (Mark: 5).

> “She knew where she was handling things and it was really good, because she puts her hands in very particular places. It’s hard to put it into words but it’s just the way she does things like that. I was thinking to me self “oh I feel a difference there” (Ron: 33/34).

One client described that he had confidence that the therapist knew the best position to place him and herself into in order to work on a movement.

> "What she does is put her hands in the correct place and she places me where I need to be for that specific exercise" (Joe: 25/26).

5.5.3.1d Function

Clients enjoyed practising activities during therapy which they could transfer into everyday activities. All clients were aware of the value of complete tasks but it wasn't apparent from the interview responses if clients' perceived links between components and complete tasks.

Awareness of the difficulty in regaining function varied. Joe participated in this study several months after having a stroke and he explains that he thinks recovery will take time and hard work.

> "I think it's going to be one of those cases where it'll have to be worked upon. You know, one session is not going to do it. It's going to need lots of sessions and practise. To wake the muscle up and, get it back in working order" (Joe: 15)

Mark who participated in this study three weeks following a stroke expressed his goal regarding his recovery; at this point he was able to walk unaided and had some movement of his right arm and hand.

> "Basically get my life back the way it was. Use my hand, right-hand side one. I've got a motor bike as well so I'm hoping to get back onto that (Mark 2-7)

Clients reported that they experimented with movement when Physiotherapists were not present. Some worked with family members, others reported working independently. The activities varied, some were deliberate repetitions of movements which had been worked on during physiotherapy sessions, with the objective of repeating exercises or practising movements they had done in physiotherapy sessions.

> “Me and my wife, yesterday, we did a bit of physio on my hand and slowly but surely it’s feeling that little bit better (Joe: 14).

> “I liked the way she was holding there. I was waiting for her to see what she’ll be doing and then I’d copy it in a way that I can (Ron: 115/121)

> “When James has suggested things, you go back and think about it”. (Mark: 128).

Participants described awareness of emerging movement and control and described their enjoyment and satisfaction in working with this independently to find out what they could do.

> “I'd opened my hand before, by myself you see, so I was trying to do it again” (Dorothy: 53).

> At first it wouldn’t do what I wanted it to do. Slowly things started to move. I couldn’t move my fingers, I couldn’t make a fist and now I’m getting there” (Mark: 15-17).

Some examples were very functional but participants also suggested that they experimented with movement without a specific function in mind. Simply trying movement to see what they were able to manage.

> “Yes, I'm moving that all the time myself, trying to move it” (Jean: 5)

> “I try to do as much as I can and I don't want to get stiff again” (Dorothy: 87)

5.5.3.2 Theme 2: Client’s physical and sensory awareness

Subthemes

a. Movement (posture and specific joint position)
b. Discomfort

This theme describes and explores clients’ physical awareness about their own movement and about the physical aspects of the interaction with the therapists.

The level of sensory/proprioceptive return varied between clients; in general, those with poorest return engaged the least with the overarching aspects of the therapists' intentions. They followed therapists' instructions but were more reliant on therapists' for feedback and they initiated less, were able to follow assisted movements but found it harder to control components the movement independently.

5.5.3.2a. Movement (posture and specific joint position)

The degree to which clients could feel the specific position of their arm varied however all had global awareness of the limb; the inclusion criteria for this study may have influenced this factor. Clients described awareness of changes in movement occurring as result of their interaction with the therapist.

> "What I could feel at the time was that my shoulder blade actually moved" (Ron: 30).

> "Yes I could feel it where she was touching me around this area and there seemed to be a bit of freedom there" (Joe: 72)

Other participants were aware of the accuracy of their movement with regard to parameters including for example, range, speed and coordination. This allowed determination of movement quality. Clients evaluated both the magnitude and the quality of their movements. When participants had been unable to control their movement they explained what they had found difficult and pleasure was expressed in response to examples of increasing movement control.

> I knew I was doing it, well. You know when you do something and it's good" (Jean: 61/62).

> "I put it on the table too hard there, mind; I remember putting my hand on the table too hard, it's hard keeping my arm stretched," (Dorothy: 94).

5.5.3.2b Discomfort

Participants reported that some of the techniques were uncomfortable but that they did not object because they felt the techniques made movement easier. Two of the participating clients had prior areas of injury which made some movements painful, therapists were aware of this (see therapist section 6.5.4.1c: Empathy). Clients reported that they would confide in therapists if they were causing pain. Clients reported feeling stretch rather than pain. Dorothy had fallen when she sustained the stroke and injured her affected wrist; this was still limited in range and painful on movement which both she and Rachel commented on.

> "That was with having to turn that hand, you see. That's still hurting a bit there" (Dorothy: 12).

> "Her wrist is quite stiff as well, but she's got quite good range for having had all the problems, you know. I was exploring initially, just because she said it was painful and she said that those hands had been quite stiff." (Rachel 111/113)

> "If it was painful I would say – I mean some movements were a little bit sore- but they weren't painful you know it's like it helped when I stretch out my arm" (Ron: 80).

5.5.4 Linked themes between therapists and clients

5.5.4.1. Collaboration (Therapists)

Subthemes

a. Communication
b. Decision making
c. Empathy

5.5.4.1a Communication

All therapists discussed the importance of being aware of client goals and of ensuring that clients were aware of the link between their goals and the interventions offered during individual treatment sessions. This included the goals set as part of team meetings and those which were achieved during the sessions. This was expressed very overtly by therapists working in the hospital with clients in the early stages after stroke.

> "I know that it's the functional things that they take away from the session more than the exercises and how high they can lift their arm. It's whether they could pick something up and it tends to be that that they set as their goal. So I try and relate movement to that as well" (Rachel: 11/12).

In addition to setting goals, participant therapists described a number of areas which they felt formed the basis for discussion with clients. These included areas where the therapists might be expected to lead, for example explanation about the content of the treatment session or directing the patients focus and attention to the area being treated.

> "I did a lot of work when I first saw him to look at his hand and imagine it moving, making mental images. (Vicky: 112).

> "So that's what I wanted him to feel. That the initiation should come from his hand rather than his scapula and his shoulder (Vicky: 107).

Other areas were discussing changes in movement or medical issues since the previous treatment session and asking for feedback about client awareness and sensory experience of movement.

> "His wrist is a bit stiff to get the extension and he's been getting quite a bit of pain in his wrist because of the stiffness. But he found quite a lot of relief from the joint distraction" (Vicky: 127)

> "Now this is a bit of problem that I've had. She's had to do this now a few times. It's not so bad there now, but at times... ... If I turn it or I do something ... Oh dear. It is really, really painful" (Joe: 134).

During treatment therapists discussed that interaction based on verbal communication varied between clients and that some individuals initiated discussion and asked more questions than others.

Therapists were also aware of non-verbal interaction including eye contact (with therapists and task) and level of engagement /concentration on the task; the example below demonstrates the point in testament when Dorothy automatically engaged in a functional reach.

> "But then she just went straight ahead and did it, we'd already worked on it a little bit and it was automatic for her as well, because she went, "Cup, hand… That's what I do with it." (Rachel: 83)

5.5.4.1b Decision making

Therapist were aware of "leading" some components of the treatment session; these were primarily those related to identifying factors limiting movement or function and decisions about treatments to address these. This included treatment positions, environmental adaptation and physiotherapy "techniques".

> "So I took him over to the table to look at a different position to treat him in, really. Finding a position that we could de-weight his trunk so I could try and access some shoulder flexion" (Vicky: 6).

Therapists reported that the physical application of these areas were interactive and based on client and therapist awareness although the therapists expressed responsibility for the outcome.

> "I was thinking because she'd been saying about how she wanted to use a hand for reaching for things – and, obviously, knowing the set-up of the ward, like, the tables and what she has to reach to and the kind of height that she needs to be able to access" (Rachel: 56).

This was discharged by adapting the intervention to the changing needs of the client during execution of the movement/treatment or by pausing, re-establishing the therapists' awareness and recommencing treatment. The

extent to which this was done overtly with the client (through discussion and demonstration) or was primarily a reflective process varied and was in some part related to the client's engagement and sensory awareness.

> "Yeah, you just... You just ask them because it's their body, isn't it? They can often feel more Yeah? You just ask them because it's their body, isn't it?" (Kath: 162)

> "So I came under his scapula again, and tried to give him the feeling of extension, so that he would access his back muscles and his rhomboids and his lower trapezius to come up into thoracic extension" (Vicky: 83).

Therapists appeared to make decisions about placement of objects and relative positon of therapist and client and to be directive during the "preparatory" aspects of the treatment; clients' took greater control over decisions related to speed, direction, joint alignment and hand position during functional tasks.

> "If I asked him to pick something off the top of a shelf, he probably would struggle. But if I build that up, and ask him to, say, pick something off the table and then something a little bit higher and a little bit higher, you're looking at more control" (Kath: 134).

Therapists reported that an objective of treatment was to increase client ability to complete daily activities as independently as possible. However, therapists evaluated movement quality and clients were encouraged to attempt tasks where the therapist believed that the movement pattern would promote normal kinematics. Participants reported that this was discussed with clients but this area of decision making appeared to be driven by the therapist.

> "Because, in her mind, it was like, "Oh, it's really good. I'm trying to reach for it." But if she wasn't getting it in the right pattern and it was going to be problematic, it was to explain to someone like Dorothy who could fully understand why it would not be the best thing to do but show her that we could work on it for her to get it done properly." (Rachel: 76)

> “And to also check, I suppose, if he's got the ability to do exercises himself without needing that feedback. Sometimes, with upper limbs, you can give them exercises to go away and do. But if they're not able to do them correctly, you're just teaching them a bad pattern. And you might want to keep away from that” (Kath: 75)

5.5.4.1c Empathy

Therapists discussed the need to consider the client’s experience during treatment; this was in part related to ensuring that physical discomfort was kept to a minimum and partly in trying to avoid emotional distress consequent to treatment including aspects of movement control or functional demand which the client was not able to accomplish. Therapists also considered that linking treatment to clients’ goals was a means of expressing their understanding of the experience of stroke from the clients’ perspective and of demonstrating that the client had the primary role in establishing the direction of the treatment.

> “I just wanted to check I was making it better and not worse, I was aware that he was probably starting to get quite tired, because we'd done a lot of work around one area. I’d said to him, when he went back, “If you need any painkillers, tell the nurses.” Because it’s a lot on one area, isn't it?” (Kath: 173175)

> “I don’t think she had realised she had that much activity in her hand until we went through it with her. Dorothy is very engaged, she always watches what you’re doing and she’s getting a lot of visual feedback from that. If Dorothy is looking she gets a lot more activity as well, she really stimulates everything” (Rachel: 20-23)

5.5.4.2. Collaboration (clients)

Subthemes

a. Client/ therapist relationship
b. Discussion
c. Engagement

5.5.4.2a Client/therapist relationship

Clients expressed a number of different relationships with therapists. Firstly, clients expressed that they valued the therapist's knowledge and previous experience of the effect of stroke and considered the therapist as a means of helping them to recover after stroke. Terms provided by clients included "teacher" and "guide"; these suggested that the client considered the therapist had expertise which the client should follow.

> "James is directing things; there are things I don't think about because I've never been in this position before. So I'm just relying on James to guide me, basically" (Mark: 53 /88).

> "I mean, she's the brains of the operation, she's the teacher and I'm the pupil" (Joe: 3).

This required that the client trusted the therapist and their knowledge base and their ability to direct treatment. This was expressed in terms of awareness of therapists "ability" which was based on the accuracy of the information provided by the therapist and on the client's individual experience the effect of treatment.

> "I feel as though I can ask her lots of questions. What she's doing and why she's doing it. I think she is more than good. I think she's spot on" (Joe: 5/7).

> "It's funny to explain but like, when she sat behind me and had her knee in my back I felt really good. I knew then, she knew what she was talking about" (Ron: 26).

Further to the role of coach or mentor, clients expressed the value they placed on the personal component of the interaction. This was expressed as the degree to which the therapists listened to them, respected and discussed their questions and concerns, and imported their feedback into treatment.

> "I feel as though she wanted to know, she was asking me how it felt and where" (Dorothy: 175)

Some interactions included humour and teasing about treatment content which both the client and the therapist alluded to positively.

> "She mixes it all up so it doesn't become boring. It's a standing joke between us now. "Oh... Oh... What's she thinking about now? Oh, you're dangerous when you start thinking... It's a private joke between us (Joe: 56/ 57)

> "He can tell by my face that I am thinking ….. "Oh, I know that face"" (Vicky: 98).

However, clients also considered that they had a role in their own recovery. This was expressed by one client with regard to feeling responsibility to participate and by another as executing choice and control over level of participation although this may affect outcome.

> "The physio is trying to help me. I believe you've got to put as much into it as they are" (Dorothy: 100).

> "Well, if I don't do the work, it won't get better by itself. The therapist might say, "Do this, do that". But at the end of the day it comes down to the person" (Mark: 89)

5.5.4.2b Discussion

This category overlapped with interaction. Most clients were happy for the therapist to lead the session but comments suggested that this was based on their experience that therapy was making a positive contribution to their recovery.

> "I feel the movements, like I say, I trust her completely, and I more or less place myself into her hands. She knows what she's doing" (Joe: 45).

> "Very useful, the way she's explaining things was spot on it. I couldn't manage it me self but what Kath did made me, me arms getting stronger "(Ron: 5).

However, clients reported that decisions made about treatment were based on discussion. This was part of general observation about treatment and specific discussion of goals. Participants varied in the specificity with which they expressed their goals.

> "She asked me what I wanted to do. I would say be more mobile or be able to do a little bit more" (Dorothy: 99).

> "I know what she's trying to achieve. We've got a goal; we've set our map out to get there. But it doesn't become boring. It doesn't become tedious" (Joe: 56/ 58)

> "Basically get my life back the way it was, use my hand, right-hand side one. I've got a motor bike so I'm hoping to get back onto that. If I don't, as long as I can drive my car, that would be great. (Mark: 1/3/7)

Clients described discussion at the beginning of treatment session provided the opportunity to share progress or to describe areas of difficulty that they had become aware of.

> "In the beginning when I was cleaning me teeth what worried me at first was getting them clean, it was like "how do I do it". My right hand was – oh I don't know- was like second class if you know what I mean" (Ron: 1/2).

One client expressed awareness of his recovering movement control and felt that he wanted to progress this. He felt frustrated about the amount of therapy time he was offered and explained that he would like to have greater support and more time to discuss his own ideas. He expressed motivation and was practising moving on his own but felt that he required more information and advice.

> "All the strength has gone out of there. You need to get more strength into there, don't you? So you need a bit weight or something. Just to build that muscle back up again. That's what I think about it, anyway" (Mark: 62)

> “I would like his advice. I thought the awareness and the strength of my fingers. Like maybe use a squash ball, to do that, will that be alright or will that do harm?” (Mark: 85).

Clients initiated discussion by sharing information for example about past medical events, previous limitations to ranges of movement, ideas about treatment and areas of concern. For example, here the client and the therapist worked together to decide on an effective position for the next part of the treatment. This was based on shared awareness of the purpose of the intervention

> “She was saying, “Right, what are we doing next?” And we moved along to the edge of the table and we were working together here. She’s explaining what she’s trying to achieve and I’m thinking, “Well, if we go here ... If we do this” (Joe: 61)

All of the clients explained that they continued to practise movement out with therapy sessions. This included various approaches; using the upper limb for daily function including grooming eating and drinking which was within the client movement capacity although not easy. Clients also described attempting tasks because the opportunity occurred. In the example below the client expresses both initial challenge and the need for persistence.

> “It was someone gave me some chocolate the other day. And I couldn't get in, you know. But I did, in the end, manage to open the... The... packet” (Jean: 184)

Three of the participants demonstrated during interviews that when they were sitting alone they moved their arm in order to determine how much they could do.

> “What I thought to meself ….. …..I was like putting me arm behind us (demonstrates arm movement)” (Ron: 118).

> “Yes, because I'm moving that all the time myself. Trying to move it” (Dorothy: 15).

> “You know... ... I have a little bit of a reach up there. (Jean: 176)

> “Oh yes I was a lot. Like the way I was-leaving my hand down like that so it moves (demonstrates). Well I was able to move but it’s funny, it’s the same nice feeling” (Ron: 148/154).

5.5.4.2b Engagement

Clients’ comments suggested that during therapy sessions their concentration was on what they were doing and they were focused on the interaction with the therapist. The words chosen to convey their thoughts during treatment were very specific and participants recalled a great deal about the treatment without the prompting offered by the tape.

> “When my hand was on the table it was natural for me to say, “what shape has she got my hand” At that point you can see I was watching her with me hand and I wasn’t watching anything else, I wasn’t aware of anything else” (Ron: 90/94).

> “I’m concentrating on my hand, and on my grip. I was trying not to let it (the object) drop down. I was trying to do it but I couldn’t use my thumb” (Mark: 110/115)

5.6 Discussion

Discussion of findings in section 5.6 is supported by the evidence provided through themes derived and quotes presented in section 5.5.

5.6.1. Physiotherapists’ themes

5.6.1.1 Theme one: Structure of the treatment session

5.6.1.1a Previous experiences of working with the client

Treatment sessions were influenced by the therapists’ prior knowledge of the client’s movement, sensory and functional status collected from initial assessment and the client’s response to previous treatment.

Discussion suggested that therapists had objectives for the session which were linked to overarching treatment goals, this is in accord with person centred care and professional guidelines (ISWP: RCP, 2012; NICE, 2013). Less experienced practitioners relied more on advance planning, they matched the session to findings from previous assessment and existing goals. This partially concords with findings of McGlynn and Cott (2007) that novice practitioners are more likely to base treatment on quantifiable sources of evidence, in this case their baseline assessment. Information derived from treating the client previously were used by all participants to direct the present treatment and related to area of treatment focus, areas to progress or modify. Thus treatment was not considered as a single event but as one in a series of interventions; experienced therapists projected from this session forward to subsequent sessions. This accords with the opinion expressed by Greehaugh (2008) that clinical decision making is not based on a single event.

More experienced practitioners modified their plans in relation to observation during the session. Treatment was based on awareness of baseline which was verified at the beginning of the sessions but reflection in action was employed so that the session developed in relation to the way that the patient responded, thus treatment was overtly person centred with respect to key features identified by Higgs *et al*., (2008). Greater experience also contributed to more ability to predict response. These observations concord with existing work about facets of expert practice; those with more experience demonstrated an organised but more holistic reasoning process and described the rationale for interventions in more detail, they relied on experiential knowledge of treating other stroke clients and they reflected more during delivery of the treatment (Jensen *et al*. 2007).

5.6.1.1b Intentional re-assessment or alteration (in content or delivery) in response to changes in the client's movement control during the treatment

Therapists monitored changes in the client's movement control as a result of treatment and used this to support decisions related to alteration in content

or delivery of the intervention during the session. This was a deliberate activity on the part of the therapist and was undertaken in order to support or refute their understanding of biomechanical and neurological impairments supporting the patients' movement. Thus both pattern recognition (PR) and hypothethico-deductive reasoning (HDR) were employed. PR contributed to reflection in action; the information was assimilated and evaluated immediately and determined the next action, this is in accord with the model proposed by Jones (1992). When HDR was employed therapists paused, reflected on their previous action and took more time before continuing. These were points at which client collaboration was actively sought; this represents collaboration described by Edwards (2004) based on a mutual construction of meaning.

Findings suggested that clinicians employed propositional, professional and personal knowledge as identified by Higgs and Titchen (1998) and demonstrated concord with some of those of Edwards (2004). The focus of this study was very precise which limits comparison with Edwards (2004) which is about decision making in a wider context. However, with respect to treatment decisions about the hemiplegic upper limb the areas which participants identified were relationships with procedure (especially the use of touch to guide movement), collaborative reasoning with clients, influences of specific and wider training and experiential learning. Information to support treatment decisions was drawn from speciality specific knowledge, patient knowledge and knowledge of self (confidence in applying techniques) all of which are components of the model proposed by Edwards (2004).

Evaluation of response to treatment of the hemiplegic upper limb was used by therapists in order to support understanding and to develop treatment. Findings endorsed the cyclical model proposed by Jones (1992) which suggests that treatment has a central role as part of the clinical reasoning processes of physiotherapy.

5.6.1.1c Experiential learning.

Therapists in phase 3 of this study identified that their selection and delivery of interventions were influenced primarily by theoretical knowledge and experiential learning. Areas of knowledge which were specifically identified were stroke pathology, features of aberrant motor control (both normal and secondary to stroke) and neuroscience related to neuroplastic adaptation.

Therapists reported that undergraduate teaching about these areas lacked precision. Physiotherapy texts and research papers did not provide practical guidelines to support recognition of complex physical presentations and performance of technical aspects of treatment techniques. Thus treatment skills and the ability to adapt techniques to the presentation of a specific client had been developed through other means. Those which described as most influential were working with more experienced therapists, post graduate practical courses and learning derived from other areas of physiotherapy practice.

This is supported by Case, Harrison and Roskell (2000) with regard to the effect of clinical experience on reasoning in cardio respiratory physiotherapy practice. Findings suggested that it is this experience which supports the practitioner to organise and contextualise their theoretical knowledge base and the study concludes that understanding of this should be used to support development of opportunities for skill acquisition at undergraduate and postgraduate level. The findings of the current study support that in relation to neurological physiotherapy for treatment after stroke and extend explanations for the value accorded to courses to integrate theoretical knowledge with supported practical learning.

Resources are available to physiotherapists online and discussion groups can be accessed through the CSP homepage (www.CSP.org.uk) however there is little access to postgraduate practical teaching materials. Teaching and learning in undergraduate courses utilises electronic support further

work should be considered with regard to using this to support graduate learning.

5.6.1.2. Theme two: Treatment rationale:

5.6.1.2a Addressing specific features of movement

Objectives of the session were in line with the suggestions of Lennon, (2003), Tyson and Selly, (2006), Natarajan (2008) and included normalisation and control of muscle tone, promotion of normal movement patterns and promotion of function.

Participant therapists provided rationale for the inclusion of the interventions they had delivered. This was expressed in terms of addressing altered features of biomechanics, motor control and sensation secondary to stroke. Treatments included joint mobilisation, soft tissue release, passive and active movement. These are identified as part of physiotherapy practice by DeWit (2006), Donaldson, Tallis & Pomeroy, (2009) and the ISWP: RCP guidelines (2012). This suggests that the content of current practice was based on theoretical knowledge and supported by research evidence as reported within guidelines however therapists did not cite specific supporting research.

All participants described altering treatment as a result of evaluation of the effect of the intervention. However, the depth of description varied. Some participants described considerable awareness based on reflection-in-action during treatment delivery. This supported meta-analysis such that movement features were identified precisely and discussion based on organised and logical reasoning process linked findings from reflection with the intervention delivered. Additionally, a wider number of influences on treatment decisions were identified including those derived from other areas of physiotherapy. These are in accord with features ascribed to expert practice by Jensen *et al*, (2007), thus these findings support extant work. Although Case, Harrison and Roskell (2000) reported that expert status is not directly attributable to

time in practice this level of description was most apparent from senior therapists in this study.

The description of features of movement by participants was primarily based on the use of touch and facilitation to determine areas of movement discrepancy and effect of treatment. The use of this rationale was identified by the work of McGlynn and Cott (2007) who discussed the use of formal and informal knowledge and that expert practitioners are more likely to employ informal indicators based on observation and evaluation of movement features determined through touch.

The rationales described are compatible with neurological theory and the re-establishment of motor control through neuroplasticity (Krakauer, 2005), prevention of learned non-use (Krakauer, 2005) and the inclusion of recent evidence based therapy through repeated practice and task specific movements (Winter *et al*., 2011; ISWP RCP guidelines, 2012).

Interventions identified were consistent with both the Bobath concept (Raine, 2006; Graham *et al*., 2009; Raine, Meadows & Lynch Ellerington, 2009) and the Motor Relearning Process (Carr & Shepherd, 2010) but delivery described by all but one of the participants included facilitatory handling (see glossary) which is exclusive to the Bobath concept. Extant work has identified that many UK physiotherapists base their practice on components of the Bobath concept although they may not employ all aspects of its teaching (Davidson & Waters, 2000; Lennon, 2003). However, the terms used by participants in this phase of the study when explaining the rationale for their decisions were linked to the aspects of movement which had been determined through facilitatory handling. It is possible that there is an exclusive link between the means of evaluating movement and identification of treatment and that this may limit practice. This should be explored further.

5.6.1.2b Increasing Sensation

This was addressed both independently and as part of movement. Therapists supporting rationale described objectives of increasing global awareness of the upper limb and awareness of components relevant to movement.

The role of sensory information in supporting anticipatory and responsive postural control mechanisms is documented in neuroscience (Kandel *et al*., 2012) and forms part of the theory associated with neurological rehabilitation (Shumway Cook & Woollacott, 2007). Therapists described direct use of sensory stimulation in order to improve specific sensory awareness of the limb, this included skin touch, soft tissue lengthening and joint stretch compression. These are components of normal movement sequences which some patients lacked the control to experience for themselves.

However, sensation and movement were also stimulated and integrated through assisting the client to move the limb either in physiological range or as part of function. This provides sensory stimulation to the arm and associated areas of the body and is supported by theory derived from the Motor Relearning Process; that sensory information relates to specific movement (Carr & Shepherd, 2010).

Treatment of sensation is suggested by the ISWP RCP (2012) guidelines although the mechanism through which this is achieved is not defined. The schedule validated by Donaldson, Tallis & Pomeroy, (2009) for treatment of the upper limb after stroke noted all the interventions reported by participants in the current study. Thus treatment described is supported by neurological theory, clinical guidelines and peer support.

5.6.1.2c Working for Activity/function

This was a key area of interventions and is supported by clinical guidelines and research evidence (ISWP: RCP, 2012). Participants worked towards building the skills needed for a specific action and to providing the possibility of being able to practise that action. This is supported by a reasoning model based on the International Classification of Function (WHO, 2001). There is additionally support from neuroscience (Kandel *et al*., 2012) and the primary paradigms for neurological rehabilitation (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010).

Upper limb tasks were based on reach, grasp and manipulation and in addition to practice of complete tasks participants worked with clients to improve the patterns of key components. Thus treatment addressed areas of movement which had relevance and transferability into many functions, these included head and neck movement, scapula stability, hand positioning and shaping and could be practised by clients in isolation as well as in combination. This is supported by neuroscience (Kandel *et al*., 2012) and theory related to motor control of the upper limb (Shumway Cook and Woollacott, 2007).

All therapists encouraged clients to practice functional movement out with therapy, conflicts reported by therapists regarding repeated practice and quality of movement are reported in section 5.7.1.1

5.6.2 Client' themes

5.6.2.1. Theme one: client' observations about treatment

5.6.2.1a Effort

Findings from this phase of the study suggested that clients valued physiotherapy (although this may be a characteristic of participants prepared

to engage in a study of this nature. Clients found treatment challenging but enjoyable. This aspect of treatment is in accord with promotion of neuroplastic adaptation as a factor in motor learning resulting from optimum challenge to the recovering system thus both (Carr & Shepherd, 2010).

Therapists reported using observation of client's movement performance and physiological indicators of effort in order to determine the amount of challenge provided. This is in line with physiotherapy codes of practice (CSP, 2011) and client centred care (Dept of Health, 2010). Therapists indicated that they reduced challenge in order to promote success and maintain client motivation (see section 5.7.1.1 Empathy). Clients reported enjoyment from attempting higher levels of challenge and were less concerned with immediate outcome. This difference in perspective should be considered as part of collaboration and is worth exploring in future work.

5.6.2.1b Satisfaction

Clients reported satisfaction with treatment methods. Areas where satisfaction was limited were amount of treatment and support for working independently. Clients found difficulty remembering exercises after therapy sessions and requested more support /instruction and opportunity to discuss aspects of their treatment with therapists. This is in accord with the findings of McGlinchey and Davidson (2014) and Hajjaj *et al*., (2010) which reported therapists and medical staffs have to determine priority of clients because of non-clinical claims on time. This is supported by Buckman (2013) which reported government data that treatment time on stroke units does not meet designated standards. Berhardt *et al*., (2004) and De Wit *et al*., (2005) demonstrated that much of clients' time is spent in non-therapeutic endeavours. Comments from clients in this study suggested requirements for more therapy and support for meaningful use of non-therapy time. This is considered by (Buchan, 2002) with regard to skill mix and Harris *et al*., (2009) in relation to self-administered graded exercises. There is variation in client presentation and need and this was apparent from the range of

comments made by clients participating in the current study. This is an area which warrants further investigation.

Clients also wished to contribute to treatment rather than “receive” it. This is documented in existing research about collaboration and in discursive publications about ways of achieving person centred care (Edwards, 2004) Responses suggested that areas which were important to clients were variety in treatment, inclusion of their own ideas about movement and “exercises” and trying things out for themselves and feeding back to therapists. Research suggests that collaboration of this nature represents a feature of expert practice (Edwards *et al*., 2004; Jensen *et al*., 2007).

5.6.2.1c Effect of therapist’s hand position

Clients reported some uncertainty about the movement which therapists’ wished them to perform; this was more associated with “faciltatory” guidance” but also related to “exercise” and was not unique to those with the least sensation. This experience may have related to therapists increasing the difficulty and complexity of movement demand by reducing the verbal and sensory cueing as the client’s motor control developed which is in line with therapy based on the Bobath concept (Raine, Meadows & Lynch Ellerington, 2009).

Clients’ reported increased confidence when more instruction was provided however research suggests that helping individual’s to “monitor” their own movement is more valuable than external feedback in building long term motor skills (Shumway Cook & Woollacott, 2011; Schmidt & Lee, 2013). This may be a facet of treatment which should be discussed with clients in advance.

Clients reported awareness of the effect of therapy interventions to increase the freedom of their movement in specific areas (joint mobilisation and soft tissue manipulation and stretch). This was measured by clients through

functional gain but also simply that movement felt “easier and better” suggesting that quality of movement is perceived and valued by clients. Extant work relates to increasing joint range and the value of functional gain the value of movement quality to clients should be explored in future work.

5.6.2.1d Function

Research informing current rehabilitation guidelines (Pollock *et al*, 2004; RCP, 2012) emphasizes the value of repeated practice of functional activities which are meaningful to the client. Therapists identified this as a feature of their treatment sessions and clients reported awareness of “goals and objectives” as part of therapy;
However, in addition to this, clients reported that they experimented with movement independently. This was partly to practise and advance functional areas which had been part of therapy but clients also used non-functional movement in order to test their ability to move key areas or to verify their strength and level of control of new movements. Further some clients explained that they enjoyed the feeling of movement (especially stretch). This may reflect the desire to retain and extend newly released areas of movement but also seemed to be based on movement which was entirely for its own sake and not just for function.

It is possible that this relates to discussion initiated by Thornquist (2001a, b) and considered by Nicholls & Gibson (2012) as part of the remit of the physiotherapy profession which is not currently addressed in practice; the role of the body as an expressive and interactive “unit” and part of a wider personal and social identity. Loss of sensation and movement is therefore about more than loss of function.

This suggests that clients want function based on natural feeling movement rather than compensation; quality matters as well as quantity.

5.6.2.2 Theme 2: Client's physical and sensory awareness

5.6.2.2a. Movement (posture and specific joint position)

All clients had some sensory and proprioceptive recovery although the degree of specificity varied. Those clients with greatest sensation reported greater awareness of their contribution to decisions about movement and posture during treatment. This may explain some the findings of Proot *et al*., (2007) which suggested that clients value the advice and lead taken by therapist in the earlier stages of their recovery but wish to have greater independence as their movement control increases. Desire for independence may be supported by improved awareness of body and limb position in addition to increased movement. This finding suggests that increasing clients' awareness of posture and limb position which is a key aspect of treatment (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010) and reported as an important factor in clinical decisions by therapists in all phases of this study is also valued by clients. This may also be a factor supporting collaboration between client and therapist and related to client enjoyment of physiotherapy and satisfaction with their progress. This finding further suggests that self-evaluation, which is part of self-determination is important to clients, this relates to the importance that Nicholls and Gibson, (2010) placed on body awareness.

5.6.2.2b Discomfort

This observation linked with the degree of sensory awareness and provided interesting information regarding client /therapist collaboration. Client comments suggested that they contextualised the experience of discomfort within their awareness of therapy objective and the contribution of the movement/technique causing discomfort to the overall goal. Clients reported providing feedback about discomfort to the therapist but those with greatest sensory awareness also reported making their own decisions about the

timing and content of their feedback. Thus clients' interpretation and weighting of sensation appears to form part of collaboration (Edwards, 2004).

5.7 Linked themes

5.7.1 Collaboration

Therapists themes about collaboration

a. Communication
b. Decision making
c. Empathy

Clients' themes about collaboration

a. Client/ therapist relationship
b. Discussion
c. Engagement

Collaboration was reported by both clients and therapists and influenced clinical decision making about the structure and the delivery of treatment. The results were reported separately (sections 6.5.4.1 therapist; 6.5.4.2. client) in order to demonstrate the different perspectives. However, this area was important to both groups of participants and is central to the treatment experience which they shared. Therefore, discussion addresses the therapeutic relationship and interaction between clients and therapists.

5.7.1.1 Therapeutic Relationship

Clients considered that physiotherapy had contributed to their recovery of movement following stroke. Both groups reported that the client and the therapist adopted different roles within treatment. The terms employed by clients suggested that the therapist had greater knowledge and expertise with regard to the effect of stroke and the skill to influence level and speed of their recovery. To that end clients reported that therapists provided

“guidance” and clients followed. This is in accord with Sim (1998) and Edwards (2004) which reported that temporarily ceding agency and allowing an expert to guide treatment constitutes a form of collaboration.

However, clients expressed that they had choice over whether or not to follow therapists’ advice. This was based to some extent on discussion and questioning but clients also expressed their regard for the physiotherapist in terms of the outcome of treatment components; they measured this against the degree to which they perceived it contributed to their recovery. Thus clients evaluated therapists’ advice and efficacy before consenting to participate.

In addition to information discussed with clients by therapists, clients base their decisions about participation in part on their own propositional and experiential knowledge and their interpretation of their own movement. Clients also made independent decisions based on their own knowledge (for example with regard to some types of exercise) and intuition (for example with regard to the degree to which they valued and tolerated discomfort because they believed it was therapeutically beneficial).

Thus what was described is in accord with the work of Edwards (2004) that client collaboration was based on informed participation but extends knowledge of collaboration by demonstrating that clients were active in gathering information which they used to determine their continued participation and provides specific examples in relation to treatment of the hemiplegic upper limb.

Therapists made or initiated decisions about treatment content and perceived that these decisions were based on client goals. However, clients did not describe strong links between treatment and goals and identified overarching goals about regaining independence rather than smaller task related objectives. Extant studies have shown that client participation in goal setting is variable and relates to the treatment context (Thompson, 2007).

Although professional guidelines (CSP, 2011) suggest that consent is based on shared objectives and goals person the findings of phase 3 of this study suggest that goals formed a structure to guide treatment but did not direct the intervention. Interventions were supported more by the ICF (WHO, 2001), especially those aspects related to body structure and activity and monitored through reflection in and on action and dual process reasoning (Crosskerry, 2009). This reflects the complexity of clinical decisions and their development based on more than one interaction (Greenhalgh *et al*., 2008).

All therapists used function as objectives for the session this was primarily based on achievement of independent grooming, eating and drinking which may have reflected the early stage of recovery of the clients. The value of functional goals and treatment is supported by a wealth of research and professional guidance (van de Port *et al* 2007; Langhorne *et al.,* 2009; Wevers *et al.,* 2009; English & Hillier 2010; van Delden *et al.,* 2012).

Therapists expressed responsibility about treatment selection and delivery associated with their professional role, specialist knowledge base and ethical requirement to provide evidence based practice (CSP, 2011; HCPC, 2013). However, it has been suggested that therapists discharge their responsibility by designing treatment which is meaningful, variable and specific to context (Holder & Hosterbach, 2001; Raine, Meadows & Lynch Ellerington, 2009). Concern was expressed between accommodating clients' degree of movement control with advice about independent exercises and functional practice. Therapists reported discussing this with clients but comments suggested that this may have been directive rather than discursive. Addressing movement quality is a core feature of rehabilitation based on the Bobath concept; the focus is on the manner in which a movement is performed and this may result in limitation of function, this is considered to be in the client's best long term interest (Davidson & Waters, 2000).

Therapists reported that they valued clients' feedback and clients that they wished to contribute information about their feedback and opinions. This reflects the findings of Kidd, Bond & Bell (2011), that client centred practice should be based on dialogue and sharing of information. More experienced therapists requested feedback frequently and used client information to refute or validate their hypothesis. This is in accord with the findings of Jensen *et al*., (2000) about expert practice and of Tyson and DeSouza (2003) with respect to assessment contributing to understanding the reason for a client's movement.

Participant clients in this study had no expressive /receptive language difficulties. However, therapists also identified the importance of using non-verbal communication such as eye contact, client interest and engagement in tasks as part of establishing collaboration, this is in accord with the suggestions of Sim (1998).

5.7.1.2 Interaction

This was based on empathy and person centred features of therapy. Therapists expressed difficulty of balancing professional responsibility and knowledge with that of designing a "client centred" intervention; although all therapist showed empathy the more experienced therapists interacted at a more personal level and engaged more in dialogue about what the client had been able to do since the last treatment session. This is in line with characteristics of expert practice as identified by Jensen *et al*., (2000).
Key areas were also recognition of what therapists considered the "clients' perspective" and desire to avoid causing either physical or emotional pain. One aspect of this was the desire to avoid ending the session at a point where the client had executed a movement badly. This required balancing fatigue with improved motor control and may be incompatible with the clients' wish to push to the limit of their physical ability.

In addition to dialogue related to goals and treatment there was a shared component to the interaction; this was especially apparent if the client had been seen by the same therapist a number of times and demonstrated an additional aspect to the therapeutic relationship. Arnetz *et al* (2004) showed that the overt inclusion of patients in goal setting had a positive impact on outcome and satisfaction with therapy and Kidd, Bond & Bell (2011) identified that clients place importance on therapists' understanding of personal meaning about the client's life when designing an intervention.

Description of this aspect of the intervention from the perspective of both the client and the therapist expressed mutual involvement and enjoyment of working together on a common goal. This was achieved through shared jokes and referral to events which had occurred during previous treatment sessions. This may have been a means of establishing (by the patient) and conveying (by the therapist) that the objectives of each session in isolation were also part of a longer term commitment to and by therapy and that use of humour and discussing their shared experiences was part of establishing a longer term bond. There is little work describing this aspect of collaboration and its value should be explored further.

5.8 Summary

The findings of phase 3 supported the observation that delivery of physiotherapy is an interactive process and that decisions made during and about treatment are shared by the client and the therapist. However, client and therapist reported different roles and felt that they contributed to different aspects of decision making.

Clients considered therapists to have specialist knowledge and previous experience regarding recovery after stroke and trusted them to make decisions regarding both the areas of movement which should be addressed and the way in which this should be approached. Therapists shared this belief and felt that it reflected professional responsibility.

Decisions about therapy were based on knowledge, experience and physical (technical) ability to deliver the treatment which best met the requirements of the client's presentation. More experienced therapists were able to select from a wider range of options, to deliver treatment more specifically and to alter aspects of treatment during the delivery in order to provide a more "client specific" therapy. Treatment was not limited to designated "neurological" treatment options; therapists, especially those with more experience, adapted and used knowledge derived from other areas of practice and were able to respond more precisely and incorporate client feedback and suggestions.

Treatment included areas which had an evidence base (repeated functional practice, relevant and client oriented goals and mental rehearsal) but "hands-on" treatment; especially that which most reflected treatments based on the Bobath concept was also included and skill in this area was identified as being difficult to achieve by therapists.

Clients and therapists acknowledged clients' expertise with regard to their personal experience of stroke and information and feedback provided by clients was used by therapists to monitor and modify interventions. Discussion during treatment sessions included requests for and provision of feedback from both sets of participants. The degree and specificity of feedback related to some extent on the client's sensory awareness, time after stroke (familiarity with the therapy process), clients' and therapists' personality.

Clients described personal objectives which varied in depth and had limited awareness or expectation of what therapy should comprise and on occasions they were uncertain about the movement which therapists wished them to do. Those clients who had some independent movement and sensory return reported that in addition to "treatment" sessions they would like more time allocated to "discussion" of their own ideas and plans and to support their independent explorations of movement.

In addition to working to achieve functional goals identified by both clients and therapists, clients valued sensory and alignment aspects of movement regardless of their direct translation into immediate function. Clients also worked independently on self-identified movement in order to explore joint range, muscle control, challenge their own ability and because the sensation of being able to move was enjoyable.

CHAPTER 6: Overarching Discussion.

6.1 Study Aims and objectives

6.1.1 Overarching aims and objectives:

To describe current practice and explore clinical decisions made by physiotherapists in relation to the selection and delivery of an intervention for the hemiplegic upper limb after stroke. In order to increase understanding of the decision making process within clinical practice in this area by:

- Exploring influences on the selection of physiotherapeutic interventions for the hemiplegic upper limb after stroke.
- Exploring influences on the delivery of physiotherapy interventions for the hemiplegic upper limb after stroke.

This exploration is based on a paradigm of Pragmatism; mixed methods were used to collect data. The core findings of this study about clinical decisions made by Chartered physiotherapists with regard to selection and delivery of treatment for the hemiplegic upper limb after stroke will be presented under the headings below:

Section one: Physiotherapy context.
Section two: Understanding movement (theoretical background, propositional and experiential knowledge).
Section three: Delivery of the intervention.

6.2 Section one: Physiotherapy Context

This section will consider the influences of specific contextual issues reported by physiotherapists on clinical decisions about interventions for the hemiplegic upper limb after stroke. The findings built on those of existing studies to demonstrate that although physiotherapists primarily use propositional and experiential knowledge in order to select and design their interventions these are interpreted in relation to the client's presentation and the service structure.

6.2.1 Service structure

Physiotherapy is part of overall Health Care delivery within Great Britain and Northern Ireland and is influenced by government strategy (GB: Dept. of Health, 2001; GB: Dept. of Health, 2005; GB: Dept. of Health, 2007). Government initiatives for treatment of stroke include the development of Specialised Stroke Units (GB; Dept. of Health, 2001), Early Supported Discharge teams and Community based teams (GB; Dept. of Health, 2005; GB: Dept. of Health, 2007; Moule *et al*., 2011; Buckman *et al*., 2013).

The findings of phase 1 of this study demonstrated the influence of these recommendations: all respondents who worked within the NHS (75% of total respondents) worked in areas of service provision identified in RCP guidelines. Half (of all respondents) as part of inpatient stroke unit services and a quarter in early or supported stroke discharge teams. A further small group (8% of all respondents) treated clients as outpatients. This suggests that government prioritisation of treatment for stroke since 2001 has had an influence on service provision.

However, despite the stated objective of improving treatment for stroke through employing multi-professional teams there is no agreement on the structure for such developments and existing studies identified variation in provision (Moule *et al*., 2011; Buckman *et al*., 2013). Data published by The Royal College of Physicians for 2001-2 identified that only 46% of designated stroke units had all five key defining features and that staffing and skill mix varied widely; (number of physiotherapists per 10 beds: interquartile range; 0.82-1.67) (Rudd *et al.,* 2005). Consequent variability in the intensity and type of therapy offered may limit delivery of therapy which addresses the varied rehabilitation needs of this heterogeneous client group (McMillan & Ledder, 2001; Khan *et al*., 2003; Chau *et al*., 2007).

This variation was endorsed by findings from phase 1 of this study. Respondents were drawn from the upper end of the NHS clinical pay grades;

half (47.6%) were highly specialist physiotherapists (band 7) and a further 42% were specialist physiotherapists (band 6). This may indicate that high levels of clinical skill are desirable for treating this client group. However, although respondents reported access to other therapists for “joint treatment” there was also high representation of non-qualified staff on teams. Sixty percent of respondents worked with technical instructors and 25% with assistants (some respondents may have worked with staff of both grades). Although Ashburn, (1997) and Kwakkel, Kollen & Wagenaar (1999) suggested that there may not be need for highly qualified staff to deliver all aspects of treatment their work is not current and is based on small numbers of participants and poorly described treatments.

Clinical decisions are influenced by service structure and skill mix (McGlynn & Cott, 2007; McGlinchy & Davenport, 2014). Stroke services are accountable to Government, this includes the amount of therapy time offered and the degree of achievement of multi professional outcomes (Rudd *et al*., 2005; ISWP: RCP, 2012). The current service objective for acute inpatient stroke services is provision of 45 minutes daily (five days weekly) of each therapy if tolerated by the client however achievement of this standard varies (Rudd *et al*., 2005; SWP: RCP, 2012).

Information from phase 1 of this study supported this finding: only half of respondents reported meeting this target; indeed, 16% of therapists surveyed reported routinely spending less than 30 minutes with a patient during a typical treatment.

Findings from phase 2 of this study support existing work (McGlinchey & Davidson, 2014) that decisions about physiotherapy interventions and prioritisation of patients for treatment were influenced by both clinical need and financial considerations including staffing levels, staff skill and resources. Decisions about treatment were influenced by staffing levels and disposal; treatment was tailored to both the needs of the client and the skill and availability of staff. This may impact on clinical outcomes and is an

important area for further research. The influence of working with other team members is explored further in section 6.4.1

Response to Government policy to prioritise stroke has increased the number of designated stroke units. However, structures and staffing vary and this impacts on service decisions and physiotherapy interventions (Buckman *et al*, 2013; Rudd *et al*., 2015). Existing work demonstrates influence of number of staff, skill mix and MDT structure on treatment decisions (McGlynn & Cott, 2007; McGlinchey & Davison, 2014). This study extends that work by describing current service structure and some of the effects of staffing, skill mix and professional representation within the MDT on selection and delivery of therapeutic interventions for the upper limb after stroke. Future work needs to consider these factors in more depth and explore their effect on outcomes within different parts of the stroke recovery pathway.

6.2.2 Patient embodiment

Existing work documents sensory integration through internal maps of body position termed schema to inform feed forward and feedback loops involved in initiating and controlling movement. Sensory information relayed via the thalamus is used by the supplementary and association areas of the cerebral cortex to inform the primary motor area (Shumway Cook and Woollacott, 2011; Kandel *et al.*, 2012; Bear, Connors & Paradiso, 2015). This includes spatial awareness of the global position of an individual within their environment and more discrete awareness of the alignment of individual body components with respect to one another (Shumway Cook & Woollacott, 2011; Kandel *et al*, 2012; Bear, Connors & Paradiso, 2015).

However, motor control is based on both internal and external contexts. Sensory-motor integration provides physical awareness of position within an environment but movement is also informed by the meaning ascribed to the task (Shumway Cook & Woollacott, 2011; Kandel *et al.*, 2012; Bear, Connors & Paradiso, 2015).

Existing work initiated exploration of the importance to therapists of understanding movement from the perspective of the physical and emotional meaning given by an individual to “the self” and the personal meaning of the task. Thornquist (2001 b) and Jull & Moore (2009) identified that therapists working in neurology employed a more holistic approach than those working from a musculoskeletal perspective. Thornquist (2001b) additionally suggested that the patient’s self-perception (“the self”) is given greater consideration by therapists within treatment addressing neurological dysfunction although links to its specific effect on informing clinical decisions about selection and delivery of treatment were not derived.

Gibson and Nichols (2010) suggested that greater consideration should be given by physiotherapists to this aspect of patient identity in assessment and treatment. This study initiates such work in relation to physiotherapy after stroke. Findings of phases 2 and 3 of this study demonstrated that therapists ascribed importance to knowledge about sensory and contextual aspects of the client’s experience. Results from phase 2 especially revealed a deeper consideration than simply use of a holistic model; this was primarily expressed in relation to sensory integration and the role which this plays in establishing body awareness. The relation of schema to motor planning is well documented in neurological theory (Shumway Cook & Woollacott, 2011; Kandel *et al.*, 2012; Bear, Connors & Paradiso, 2015) and it is perhaps unsurprising that this was discussed by physiotherapists with a special interest in neurology. However, the focus of the comments was not solely regarding the value of sensation in informing brain areas associated with preparation for movement. There was acknowledgement that altered sensation could be linked with altered perception of being “a whole person” and that recovery of sensory awareness was part of recovery of “embodiment” and of re-establishing participation with the physical, social and emotional environment.

The degree of patient awareness in relation to “embodiment” was important information for therapists. Indeed, lack of “body awareness” was described

by participant therapists in phase 2 as pivotal to treatment decisions and prediction of recovery. Unless the patient had awareness of the parameters of their body and an understanding of the environment therapists expressed difficulty in assisting recovery of motor control and indicated poor potential for recovery of function.

This area was important to interpreting assessment findings and formulating treatment plans and should be explored further in future research.

It is possible that this concept of “embodiment” links with the comments made by clients about awareness of “quality” of movement and of their enjoyment of movement for its own sake rather than as part of function. This may reflect the re-establishment of their body parameters and agency; this is explored further in section 6.4.3

6.3 Section two: Understanding movement/ theoretical background/ propositional and experiential knowledge

This section describes key areas which therapists considered when applying theoretical knowledge about movement control to developing understanding of the movement of a client after stroke. Existing explanatory models of clinical reasoning are discussed in the light of new knowledge derived from this study.

6.3.1 Effects of stroke on movements of the upper limb

Specific studies of upper limb movement following stroke identified altered kinematics (Rohrer, 2002; Cirstea *et al*., 2003; Micera *et al*., 2005), reduced speed and poor coordination (Micera *et al*., 2005). It is likely that these result from factors affecting muscle control (Rohrer, *et al*., 2002; Cirstea *et al*., 2003; Rodgers *et al*., 2003; Tyson & Selly, 2006), postural control mechanisms (Raine, Meadows & Lynch-Ellerington, 2009) and joint alignment (Kebaetsie *et al*., 1999; Lo *et al*., 2003; McClean, 2004). Movement is also affected by sensory changes (Broeren, Rydmark &

Sunnerhagen, 2004; Shumway Cook & Woollacott, 2007; Demain *et al*., 2013) and visual disturbance (Markus, 2008; Muir, 2009) which limit interaction with the environment. Individuals are forced to adopt compensatory strategies to achieve function; these include increased trunk recruitment (Roby-Brami *et al*., 2003) and fixation of specific body segments (Cirstea *et al*., 2003). However, existing research regarding the effect of stroke is primarily derived from measuring movement under controlled laboratory based conditions. This study contributes to documentation of the effect from the perspective of clinicians with the remit of effecting improvement in these areas.

Findings of phase 1 of this study were in accord with existing descriptions: the most frequently identified consequence of stroke was ‘movement with altered pattern’, closely followed by ‘reduced muscle activity’ and ‘reduced grip’. Other common areas of dysfunction were ‘movement with altered range’ and ‘altered coordination’. Thus areas most commonly addressed by therapists with clients after stroke were reductions in movement range and quality. ‘Increased muscle activity’ and ‘reduced sensation (including proprioception)’ were encountered slightly less frequently and wider effects including ‘pain’, ‘neglect’ and ‘glenohumeral subluxation’ were less likely to be encountered.

Clearly a number of these areas are related and may co-exist. Reduced muscle activity may cause reduced coordination; altered muscle activity may affect movement parameters and joint alignment. However, presentation may alter during recovery after stroke and further work should be undertaken to document this in more detail. This would support work exploring physiotherapy treatment content and rationale during hyper-acute, acute and long term acute recovery.

6.3.2 Clinical reasoning

Clinical reasoning is acknowledged to be complex (Tyson & DeSouza, 2003; Standing, 2007; Smith, Higgs & Ellis, 2008). Clinicians interpret and prioritise clinical presentation according to perceived importance and relevance to the situation encountered (McGlynn & Cott, 2007; Davies & Howell, 2012). The use of heuristics, hypothetico deductive reasoning and pattern recognition is well documented within physiotherapy practice (Case, Harrison & Roskell, 2000; Jensen, *et al*., 2000; Childs *et al*, 2004; Stevenson Lewis & Hay, 2004; Schreiber & Stern, 2005; Jensen *et al*., 2007; Davies & Howell, 2012). Findings of all three phases of this study supported the use of these reasoning strategies.

Existing explanatory models suggest that clinical decisions are synthesised through: “the use of observation, information processing, critical thinking and exercising clinical judgement in order to select the best course of action in promoting and maintaining patient health” (Standing 2007:66). These models vary in complexity and are derived from non-neurological areas of physiotherapy practice (for example: Case, Harrison & Roskell, 2000: cardiorespiratory therapy; Childs *et al*, 2004: spinal manipulation; Davies & Howell, 2012: low back pain). However key features are the interpretation of the signs and symptoms of client’s presentation as a consequence of the practitioner’s knowledge, skills and experience in relation to context (generally of the condition or service). This is in accord with overarching classification by Higgs & Titchen (1998); that practitioners collect and analyse clinical data in relation to their Propositional, Professional and Personal knowledge which directs values and frame of reference.

Physiotherapy is embedded within a bio-psycho-social paradigm. The influence of movement difficulty/dysfunction is considered within the context of the clients’ personal, social and emotional interpretation of their health and life choices (Edwards *et al*., 2004). The findings of this study suggested that therapists’ use information about these areas to support treatment decisions.

Participants in phases 2 and 3 related information from assessment to the categories described in the International Classification of Function (WHO, 2002). However, this is an overarching model, although the information is used by therapists they may not collect it themselves. This section will discuss the findings of this study in relation to existing clinical models describing factors considered by physiotherapists specific to motor control.

Physiotherapy assessment is not standardised; approach and content is related to the information required to meet therapist's objective and their beliefs and experience (Jones, 1992; McGlynn & Cott, 2007; Davies & Howell, 2012). Previous research demonstrated overlap between assessment and treatment (Jones, 1992; McGlynn & Cott, 2007) and this study confirmed these findings in the context of treatment of the upper limb after stroke; this is discussed further in section 6.3.3.

Physiotherapy defines itself through expertise in understanding and promoting movement: "Physiotherapists help people affected by injury, illness or disability through movement and exercise, manual therapy, education and advice" (CSP, 2015). Physiotherapists evaluate clients' movement following stroke to formulate and implement action plans directed at rehabilitation of function. Components of assessment of the healthy and damaged central nervous system are detailed in Medical and Physiotherapy Textbooks (Lennon & Stokes, 2008; Petty & Moore, 2013; Stokes & Stack, 2013) and include tests for movement, sensation, balance and function. However previous work identified that the process of testing and analysis which physiotherapists use in order to develop a treatment rationale is poorly documented (Tyson & DeSouza, 2003). Findings of this study in relation to such clinical reasoning process are discussed further in section 6.3.3

6.3.3 Assessment to understand client's motor control

Tyson & DeSouza (2003) considered assessment of posture and balance after stroke and McGlynn & Cott (2007) identified components of assessment

as part of the weighting of information to support decisions in neurology. The findings of this study are discussed below in relation to their seminal work. Tyson and DeSouza (2003) determined the importance of movement observation and information derived from touch in supporting therapists' understanding of clinical presentation and proposed a template through which therapists organised their findings (see below). McGlynn & Cott (2007) endorsed the template as part of a wider scheme supporting clinical decisions. Neither study explored links between the assessment findings and treatment, some of which are explored in this study.

Additionally, Tyson & DeSouza (2003) identified need for further work to determine if their findings could be extended to other areas of practice. This is addressed by this study; the results of phases 2 and 3 support the findings of both studies and extend them by identifying key areas of dysfunction which physiotherapists consider when determining interventions for the hemiplegic upper limb after stroke.

The model proposed by Tyson & DeSouza (2003) and endorsed by McGlynn & Cott (2007) was based on three key areas:

- Establishing level of function (action)
- Establishing performance mechanism (alignment and muscle activity)
- Establishing limiting factors

Tyson & DeSouza (2003: 123-124) further identified a process of deepening evaluation through increasing both the complexity and postural demand of the task. In their work exploring alignment and posture this was achieved by progressing from static to dynamic postures and reducing the base of support to increase demand during automatic balance activities. Hypotheses regarding underlying muscle activity which explained task performance were based on observation of "alignment and movement of body segments relative to each other and the expected norm". Touch supported identifying changes in muscle length and determining if areas of altered alignment related to decreased or increased muscle activity. This information

underpinned consideration of the degree to which the observed abnormality was primary or compensatory.

However, the three components of their model are not integrated and this leaves a gap in the authors' explanation of how physiotherapists established relationships between these areas and how this was used to determine treatment objectives and interventions. This is addressed to some extent in this study, although the area of focus (assessment of the hemiplegic upper limb) differs.

Participants in phases 1 and 2 of this study identified components of neurological assessment in accord with medical and physiotherapy texts (see results of phase 1 and Appendix xii for phase 2 findings). Their objective was to understand movement of the individual client by selecting assessment tools suggested in such texts according to specific features of clinical presentation. Additionally, assessment components were combined to support evaluation of performance and function and identify limiting factors; this was in accord with the areas identified by Tyson & DeSouza (2003). Thus, information collected by physiotherapists about the effects of stroke was derived from objective assessment, observation and touch although the degree to which each was employed varied (this is discussed further below).

Relevant propositional information is standardised; there is little scope for variation in taught content of pathology, neuroscience, biomechanics, motor control and motor learning required of degree programmes to meet CSP and HCPC course content directives (see: Edwards *et al*., 2004; Masley *et al*., 2011; Davies & Howell, 2012). However, findings of all three phases of this study suggested that this is interpreted in association with personal experiential learning and post graduate clinical and theoretical courses. This creates a therapist's individual mixture of pattern recognition and Hypothetico Deductive Reasoning. Findings of phase 2 especially demonstrated that although there was agreement regarding potential content of assessment (Appendix xii), the structure of the assessment process was personal to the

therapist and based on indicators derived from their propositional and experiential knowledge. There is no current evidence to determine the extent to which this contributes to variation in practice and if it has impact on efficacy; these should be considered for future work.

One of the key new findings of this study was the role of the assessment process in supporting participants' understanding of the effect of stroke on motor control and potential for motor learning. Therapists' intention was not just to identify (diagnose) separate components of dysfunctional movement but to determine how these associated or combined in order to affect movement of the whole person. This was based on deriving information at global and specific levels and was in accord with the assessment approach proposed by Tyson and DeSouza (2003).

However, this study extended their work by demonstrating that therapists did not undertake assessment in a linear manner but employed a circular/spiral structure in order to identify key components or indicators which were used as a "starting point" from which to explore control at the "next level" of complexity. For example: if active movement of the arm was limited at the scapula and shoulder further investigation was aimed at understanding the impact of the upper limb on trunk movement and balance. If the client had movement at the shoulder and elbow, then investigation continued to determine control of movement of the arm as a unit and if the client was able to move forearm and wrist (i.e. to orientate the hand) then further exploration of the function of grasp was undertaken. Manipulative capacity of the hand was considered only if the client had some control of the rest of the limb.

This both extends existing work and refutes the suggestion that the overall decision making process of physiotherapists is "intuitive". Despite variation it was apparent from the findings of phases 2 and 3 of this study was that there was a reasoned and structured process and that it was more complex than that described by Tyson and DeSouza (2003). This is reflected in the model on page 313.

6.3.4 Assessment to contextualise client's motor control

McGinnis *et al*., (2009) demonstrated that physiotherapists approached assessment in stages. Their work explored selection of a balance assessment tool so findings of this study cannot be compared directly with it but key areas can be discussed in relation to one another.

McGinnis *et al*., (2009) described the process through which therapists formed initial impressions: expected patient presentation was compared with initial observations of actual presentation in order to inform preliminary decisions about assessment. This matched the process described in phase 2 of this study. Background information related to potential presentation including past medical history, time since stroke, location and magnitude of lesion and overall fitness to engage with physiotherapy was used to formulate initial decisions about assessment and treatment.

This was followed by initial data gathering during which movement was observed and neuromuscular examination undertaken. Therapists combined procedural knowledge of neuromuscular examination with their observations of movement in order to select assessment approaches. These observations support the earlier findings of Tyson & DeSouza (2003) and McGlynn & Cott (2007) although are not described with the same level of specificity.

McGinnis *et al* (2009) identified that therapists initiated diagnosis and treatment planning (stage 3) during the data gathering stage (stage two); this was not explored further in their study but they comment on the link. Jones, (1992) proposed adaption of an earlier model by Barrows &Tamblyn (1980: cited in Jones, 1992) to demonstrate the contribution of analysis of the effect of intervention and reassessment to problem identification in treating back pain. Findings of phases 2 and 3 of this study suggest that the "spiral exploratory structure" suggested above and based on the work of Tyson and DeSouza (2003) is in accord with this model whereby assessment and treatment processes are interlinked and the response to one forms the basis

for investigation or initiation of the other. The overt links described by participants in this study in relation to the hemiplegic upper limb further emphasise the transferability of the model and importance of this stage in supporting clinical decisions. Thus assessment and treatment were interrelated as suggested by Jones (1992): therapists in this study demonstrated use of the response to interaction as part of the assessment process.

Indeed, therapists described a process of exploration (incorporating objective testing as considered appropriate and wider exploration formulated through the model discussed above) rather than undertaking formal structured assessment. Therapists did not assess a list of items but explored movement demonstrated (and when possible selected) by the client in order to understand the basis for its form. Understanding was derived through assessing functional activity or isolated control and range of specific joints. Analysis involved constructing/deconstructing movement through increasing or decreasing complexity. Thus information collection and gaining understanding is therapist and client specific but remains structured.

The findings of this study suggest that the assessment process provided therapists with information related to impairment, activity and function. However, the primary aim was to understand individual components of altered movement. This interlinked with treatment to improve those components, increase movement capacity and apply this to increasing function. Therefore, the schematic adapted from Tyson & DeSouza (2003) can be developed (Figures 6.1, 6.2 and 6.3).

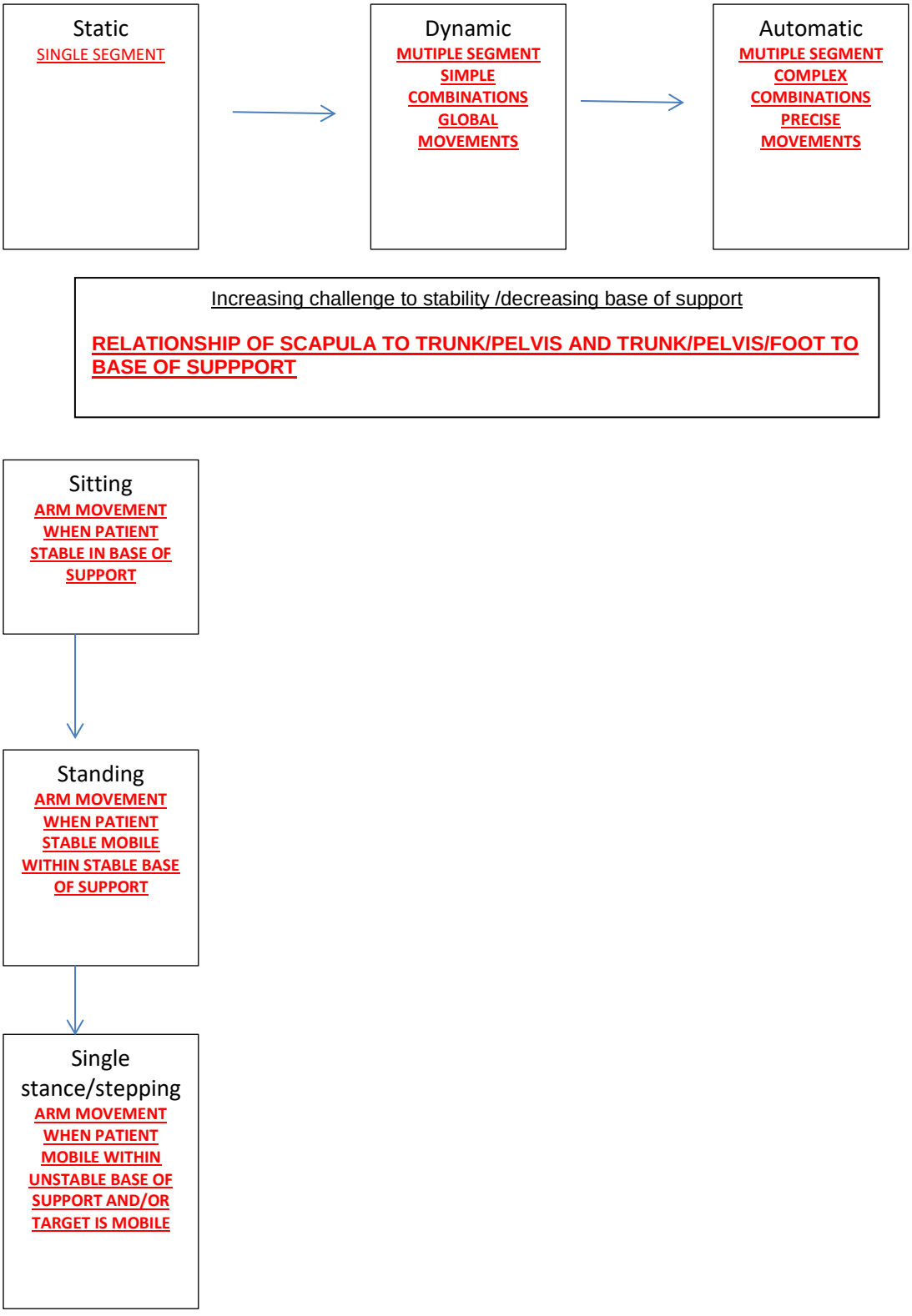


Figure: 6.1 Stage one Assessment of the hemiplegic upper limb (adapted from Tyson & DeSouza (2003) (amendments in red text). What can the patient do?

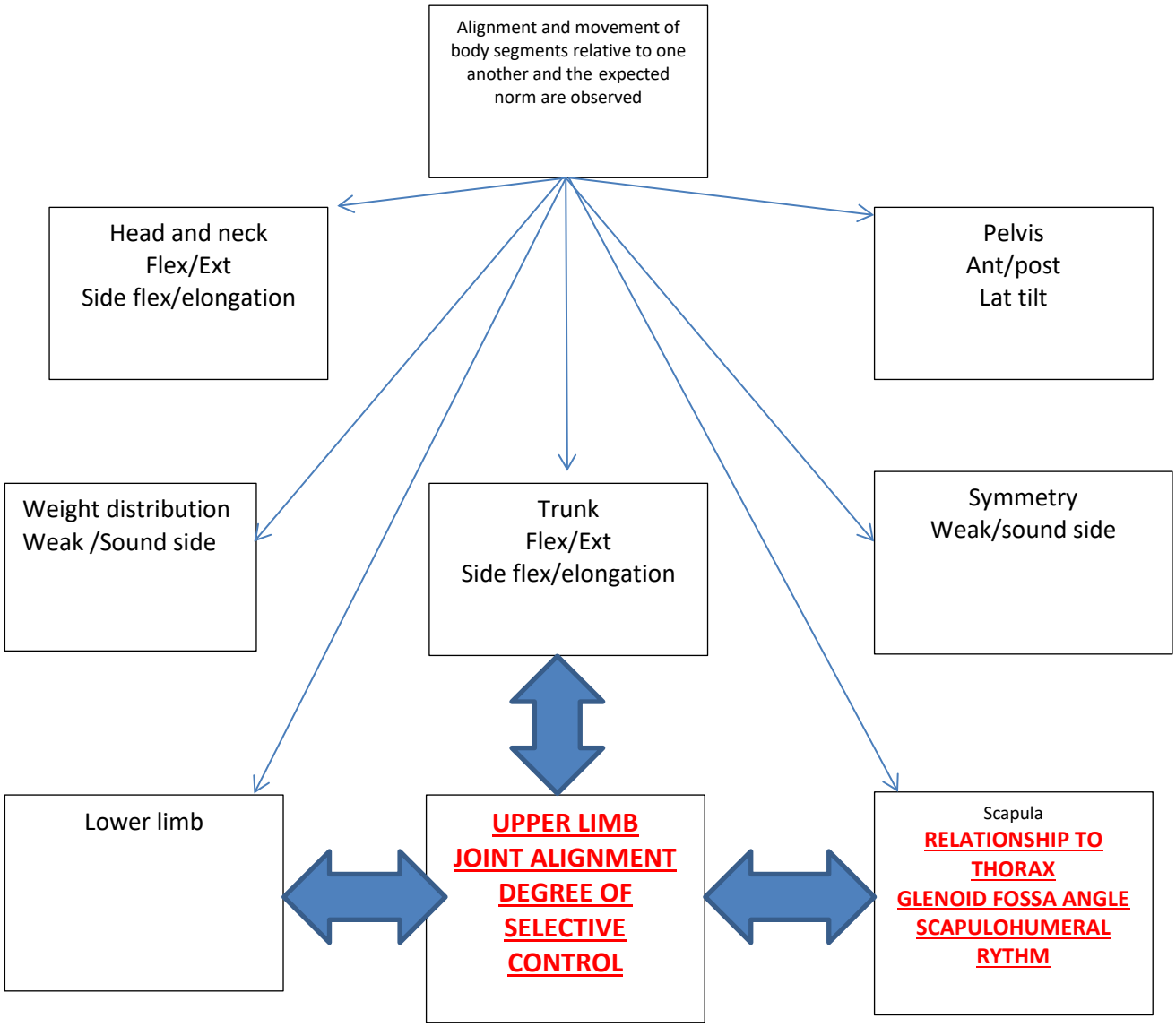


Figure: 6.2 Stage two Assessment of the hemiplegic upper limb (adapted from Tyson & DeSouza (2003). How does the patient do it? (Upper limb movement is related to balance and posture; the original representation has been amended to include the upper limb and to reflect the chain of movement control. Amendments in red and bold arrows)

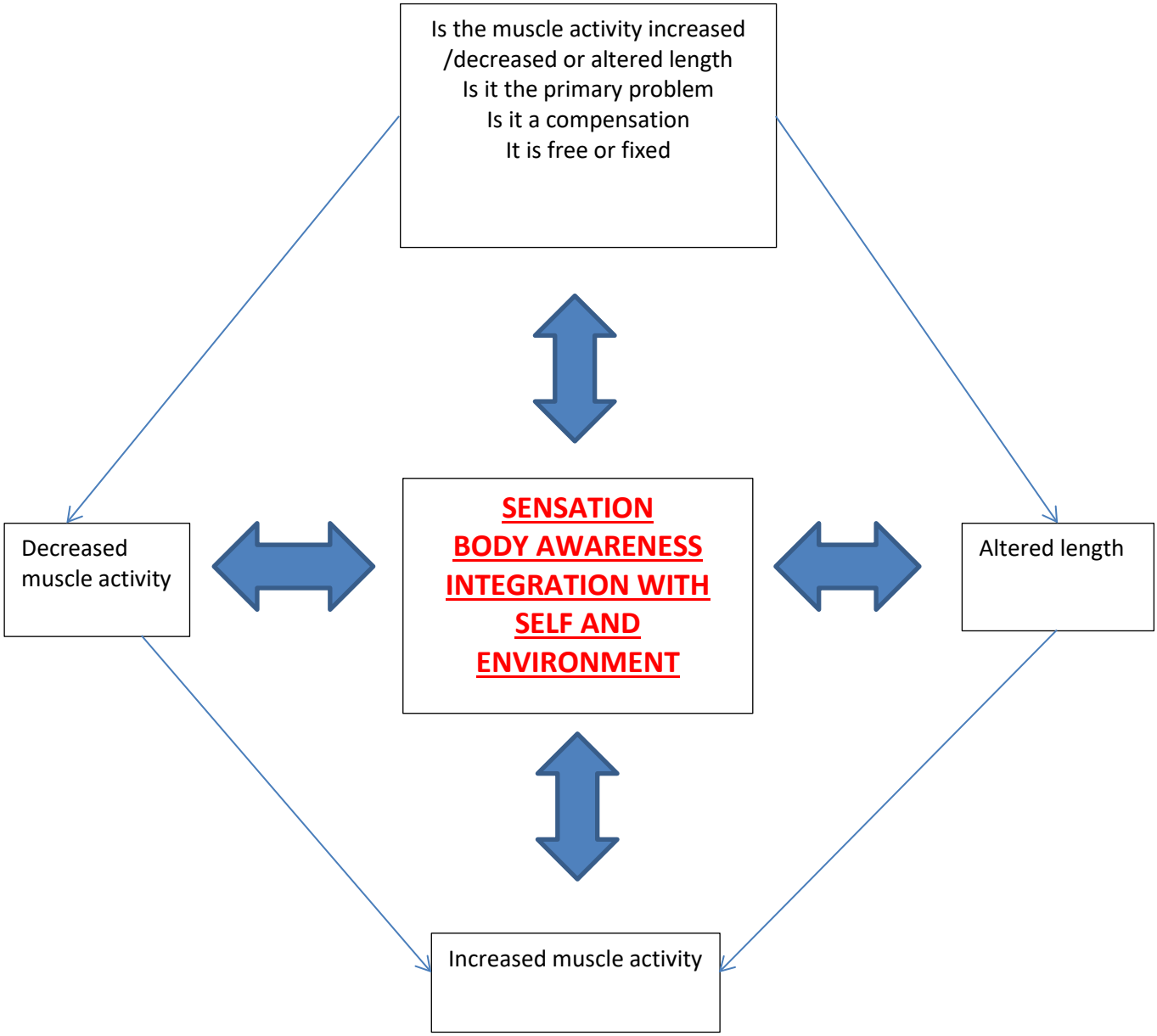


Figure: 6.3 Stage three Assessment of the hemiplegic upper limb (adapted from Tyson & DeSouza (2003). Why does the patient do it that way?
(Amendments in red and bold arrows)

Information derived through assessment /treatment and indicative items described by participants in this study are detailed in Table 6.1. Specificity of the objective increases throughout the assessment /treatment process. Objectives are linked to supporting studies (Thornquist 2001b; Tyson & DeSouza, 2003; McGinnis *et al*., 2009); specific areas which extend existing work are indicated in red.

Therapists' Objective	Indicative Item
Screening for areas which required addressing by other team members. (McGinnins *et al*., 2009)	• Pain (medical review). • Spasticity (medical review, liaison with Occupational Therapist re: splinting). • Joint alignment (liaison with Occupational Therapist re: splinting).
Screening for potential global response to treatment. (McGinnins et al., 2009)	• Awareness of self (global: body schema) • Awareness of components of self (specific: body schema); • Awareness of self -and components of self - as distinct from others. • Sensory and motor components of Interaction with /integration into environment (supporting surface, gravity, verticality). **Findings of this study** **Extends work of Thornquist (2001b)** **Biomechanical and neurological ideation of the body, embodiment – the meaning of "the whole self"**
Building understanding: postural movement control (Tyson and DeSouza, 2003)	• Interaction/engagement with supporting surface. • Posture adopted when in relation to/ against gravity •
Building understanding: segmental movement control (one area of the body in relation to another) (Tyson and DeSouza, 2003)	• Therapist observation or interaction (touch guidance) or combination of both.

Therapists' Objective	Indicative Item
Building understanding: specific movement control (Tyson and DeSouza, 2003)	• Therapist observation or interaction (touch guidance) or combination of both.
Building understanding: exploration of movement control on increasing level of complexity (degrees of freedom, challenges to interaction with base of support, specificity and precision) (Tyson and DeSouza, 2003)	• Therapist observation or interaction (touch guidance) or combination of both. • Establish ability to control increasingly complex movements (kinetic) chains, increasing requirement for interaction between areas of stability versus mobility. **Findings of this study** **Extends work of Tyson & DeSouza, (2003). Therapists described identifying a "starting point" and following a line of investigation; each stage building from the findings of the preceding stage.**
Building up from simple movements to composite movement and to precise movement. (Tyson and DeSouza, 2003)	• Therapists construct the task from knowledge of patients' movement or patient can elect the task: analysis is still based on the aspects above. • Comparison of specific features of motor control in relation to normal and expectations from pathology, previous medical history (McGinnis et al., 2009). **Findings of this study** **Extends work of Tyson & DeSouza, (2003); therapists described identifying a "starting point" and following a line of investigation; each stage building from the findings of the preceding stage.**

Table 6.1 The assessment process

6.3.5 Descriptive terminology used by therapists

The findings of phase 2 of this study demonstrated participants' agreement on key areas for assessment and the underpinning objectives; this accords with Lennon, (2003). However, this study identified subtle differences in the terminology employed during description of the findings which may relate to the method of assessment. For example, terms used to describe altered muscle activity included subjective descriptors such as "heaviness", "stiffness" of a limb and objective tests of "strength" or "range of movement".

It should be noted that the degree to which these terms were used by individual participants varied. However, if this terminology relates to the use of sensory cueing and touch guidance by the therapist during assessment it may indicate differences in interpreting and ascribing meaning and importance to assessment findings and the value accorded to self-directed movement in motor learning.

Additionally, aspects of movement were compared to a perceived "norm". Although movement parameters can be assessed in relation to a standard baseline this requires complex and expensive equipment which is not available to clinicians. Therapists' assessment in relation to normal is professionally appropriate and was mentioned by McGinnis *et al*, (2009) but if it is based on information derived from a specific perspective it may impact on treatment decisions.

These findings were subtle and the effect on treatment decisions was not explored in this study; further investigation is warranted.

6.3.6 Treatment of the hemiplegic upper limb

Physiological research suggests that proteins usually associated with CNS development during infancy and adolescence are re-expressed in response to brain injury and support recovery after stroke through adaptive structural (neuroplastic) changes (Liepert, *et al*., 2000; Cramer, 2008; Markus, 2008).

Physiotherapy after stroke is based on belief that movement recovery (efficiency and variety) during this “plastic” period is enhanced through stimulation of the motor and sensory systems (Cramer, 2008; Sylvan & Kesselring, 2011; Berhardt *et al*., 2015). Therapists base their interventions on theoretical understanding of movement control and motor learning in the undamaged system and awareness of the effect of damage to areas commonly affected by neurological pathology (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010; Shumway Cook & Woollacott, 2011; Ward, 2012). This understanding in association with the physiotherapist’s repertoire of skills and techniques supports design and delivery of interventions addressing clients’ presentation including psychological and social context (Gjelsvik Bassöe, 2007; Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010; Shumway Cook & Woollacott, 2011). This is taught at preregistration level (Donaghy & Morss, 2007) and updated through elective attendance on post registration courses as part of continuing professional development (CSP, 2011).

There is some evidence to support categorisation of post-registration knowledge through exposure (acquired electively and tacitly) to information delivered via practitioners of specific paradigms; the Bobath concept and the Motor Relearning Process (Davidson & Waters, 2000; Lennon, 2003). Despite historical differences recent publications suggest that similar neuroscience is cited by proponents of both methods in support of their rationale (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010). Additionally, surveys (Davidson & Waters, 2000; Lennon, 2003) identify many practitioners do not consider their practice aligned to a paradigm but based on understanding and application of the underpinning theory/neuroscience.

With only a few exceptions participants in all three phases of this study suggested that experiential knowledge informing their practice was derived from varied sources. This was not aligned with a named approach and included neurology, other areas of physiotherapy practice, undergraduate teaching, postgraduate courses, government guidelines and personal

application of published evidence. This is in accord with findings of existing research (Davidson & Waters, 2000). The range of interventions identified by participants' in phases 1 and 2 matched interventions described in physiotherapy texts and RCP (2012) guidelines. However, new findings of this study suggest that the selection and delivery of the interventions is also interwoven with ongoing evaluation and response. Thus experiential knowledge is informed by overarching understanding of the client's movement control (of composite and functional movement in addition to movement of joints in isolation).

This was further demonstrated in the findings of phases 2 and 3 which built on those of phase 1. Specific treatments for the upper limb: stretch, sensory stimulation, massage, splinting, joint mobilisation and muscle strengthening (using free weights, resistance bands, body weight) were described in phase 2. These were applied in phase 3 in relation to wider aspects of movement control including, balance, interaction with a supporting surface and movement executed through all links in the related kinetic chain. This acknowledged the need for integration of segmental and joint stability and mobility; concentric, eccentric, postural and synergistic muscle activity. This rationale was expressed by all participants and demonstrated the number of factors considered by physiotherapists in prescribing interventions. The decision making process recognised complexity of motor control.

However, an important area of difference was the degree to which therapists physically guided and enhanced the movement of the patient during both assessment and treatment. This feature of the Bobath concept is not shared with the Motor Relearning Process (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010). The extent of use and possible difference between touch, guiding and 'Bobath based facilitation' could not be determined by this study. However, seventy-three percent of respondents to phase 1 reported that 'facilitatory handling' was often part of their treatment and it was included to some degree by most participants in phase 2 and all those in phase 3.

Existing research (Goodgold-, Edwards, 1993; Langhammer & Stanghelle, 2000; Luke, Dodd & Brock, 2004; Pollock *et al*, 2004; Hafsteinsdottír *et al*, 2005) comparing the effect of Bobath and Motor Relearning based therapy varies in quality. Older studies may not reflect current application of teachings and research findings should therefore be treated with caution. However, this aspect of touch during treatment appeared to be used irrespective of underlying belief about a named paradigm and the intention and the degree to which it effects neuroplastic adaptation has not been investigated (either in isolation or in comparison with movement without guidance). This should be addressed in future research.

6.4 Section 3: Delivery of the intervention

This section includes, content and structure of the session, including function, and patients' exploratory movement.

6.4.1 Content and delivery of Physiotherapy Intervention is "Skills" and Profession related

Buckingham & Adams (2000a; 2000b) suggested that decisions made in and about practice are profession and speciality specific and that research related to strategies employed by clinicians should be interpreted from a contextual perspective.

a. Skills

This area is described by participants from open questions included in phase 1 and discussion in phase 2 regarding delivery of treatment in association with members of their own or another professional group. Three areas were apparent; moving, handling and safety issues related to the size and balance of the patient (i.e. is more than one person needed to stabilise the client's body or maintain position of a limb), the level of evaluation and technical skill of the therapist(s) responsible for the treatment and the objective of the treatment. Responses regarding the first two were in relation to

physiotherapy interventions and the third emerged from discussion of joint professional treatment sessions.

There was some overlap between providing safety and delivering skilled treatment. Participants in phases 1 and 2 explained that limitation of treatment implementation if staff available lacked the experience and ability or because staff numbers limited treatment options. Participants in phases 2 and 3 explained that the most experienced therapist “led” therapy requiring more than one person to deliver. However, interventions are based on interpretation of changes in client’s balance and movement. Staff members anticipate and support the actions of one other. Thus the content and delivery of the intervention is influenced by the technical skill and experience of all staff involved and this links knowledge, observation and practise. This supports the findings from phase 1 that pre and postgraduate learning is primarily achieved through guided experience. This is derived from working clinically and attending courses in order to apply knowledge, build technical skill and increase the ability to respond rapidly to changes in clients’ movement control.

Findings from phase 2 of this study develop this discussion further. Physiotherapy assessment is an “interactive” process through which a client’s independent motor control is both explored and developed. This process forms part of the “unique” aspects of the physiotherapy role. Although documenting the content of physiotherapy interventions has been initiated (see: De Wit *et al*., 2006, Donaldson, Tallis & Pomeroy, 2009) there is little work describing how these are physically achieved (Gjlevik, 2007; Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010). This may explain the valued accorded to experiential and course based learning by clinical practitioners.

Further, muscle activity supporting motor learning is recruited in response to requirement for specific function (Stuart, 2005). The position of the body in relation to gravity and supporting surface forms part of the theoretical background of treatment to activate appropriate muscle groups (Gjlevik,

2007; Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010). Tasks depend on interaction between the individual, the task and the environment (Shumway Cook & Woollacott (2007), therefore each therapeutic intervention will have similarities and differences. This limits standardisation but identification of key components would add to work defining the content of treatment; this should be addressed in future research.

Undergraduate experience is designated to some extent by CSP and HCPC directives (Dewey, *et al*., 2006; HCPC Standards of Proficiency, 2013; CSP code of practice, 2011) but the best means of facilitating postgraduate integration of theoretical and technical skills should be investigated further.

b. Profession

Existing studies exploring content of physiotherapy (De Wit *et al*., 2006; Donaldson, Tallis & Pomeroy, 2009) and occupational therapy (De Wit *et al*., 2006) interventions after stroke determined demarcation of the roles of the two professions and that treatment is differentiated (Balinger *et al*., 1999; DeWit, *et al*, 2006). Despite this, findings of extant work also suggest blurring of role definition (Smith, Roberts & Balmer, 2000) although consideration of the content or interaction during joint professional treatment sessions has not been addressed

The findings of phase 2 of this study support the work of DeWit *et al*., (2006) suggesting participant role awareness and specificity within treatment of the upper limb after stroke. However, some treatment areas overlapped or were addressed through combined physiotherapy/occupational therapy treatment sessions for example to splint the wrist and hand or incorporate specific functional activities. Responses suggested that physiotherapy specific treatment was more likely to incorporate “impairment” level of movement and overarching movement which was functionally relevant (for example reaching) but joint sessions were employed to explore and address

contextualised aspects of function (for example swallowing, eating, self-care and cooking).

This is important because potential changes in service delivery, financial constraints and managerial perception of overlapping skills may cause further role blurring (Smith, Roberts & Balmer, 2000). Joint treatment was perceived by respondents to this study as additional or complementary to physiotherapy interventions to address specific limitation of movement; this may be an indication of funding and scarcity of resources. Service level outcome measures (see: SSNAP) frequently record cumulative therapy effect. However, future work should explore effect of both individual and combined therapies in order to inform skill mix and staffing requirements.

The perception of role overlap between physiotherapy and occupational therapy is supported by some development in education. Taught “Masters” level courses are available for Physiotherapy graduates to build further skills in Occupational therapy and leading to post-graduate qualification in “Rehabilitation” (Rehabilitation MSc. Teesside University, 2015). However, although the Health and Care Professional Council recognises extended scope or dual role (HCPC, 2015) no joint professional qualification is acknowledged and separate registration requires CPD for each profession.

To date there has been little work considering the feasibility and impact of expanding practice in this way. Further work should be undertaken to explore how therapists work together and establish scope for developing therapists skilled in shared areas of practice. This may contribute to development of postgraduate training, skill mix and service commissioning.

6.4.2 Incorporation of function

Stroke guidelines emphasize the importance of addressing function during treatment (ISWP: RCP, 2012). Neurological theory underpinning rehabilitation emphasises the value of task specific and repeated practice to the recovering CNS (Raine, Meadows & Lynch Ellerington, 2009; Carr &

Shepherd, 2010; Shumway Cook and Woollacott, 2011). Physiotherapists' inclusion of these ideals into practice and the value of functional goals to clients were supported by the findings of all three phases this study. Therapists in phase 2 described identifying impairments and determining their relationship to altered function, frequently alluding to the ICF model (WHO, 2002). Therapists explained that functional tasks were included as part of their evaluation of motor control and to encourage relevant motor learning during recovery.

Neurological theory suggests that movement patterns and muscle activation sequences are task or activity related (Stuart, 2005). However extant research identifies dichotomy for physiotherapists regarding the employment of function as a basis for recovering movement unless there is also regard for the quality of that movement (Davidson & Waters, 2000; Raine, Meadows & Lynch Ellerington, 2009). Therapists expressed concern regarding clients' adoption of compensatory patterns during highly plastic stages of recovery in order to achieve function. Extant work suggests concern is based on belief that compensation reduces specificity, restricts potential for variability of motor control and limits possibility of further recovery of movement control and greater functional gain (Davidson & Waters, 2000; Raine, Meadows & Lynch Ellerington, 2009). This was also expressed by respondents to all phases of this study.

It has been suggested that this is particularly a concern of therapists basing their treatment on the Bobath concept (Davidson & Waters, 2000; Graham *et al*, 2009). However, findings of phases 2 and 3 of this study went some way to refute that. All participant therapists included function as part of treatment whilst simultaneously expressing belief that protecting "quality" of movement was part of their role. Although these might appear to be incompatible "function" was interpreted in relation to motor recovery and goals negotiated with the client were those considered beneficial to supporting or extending their current movement control. Therapists aimed to identify functional objectives which could be addressed during therapy and continued independently with the minimum of altered "compensatory" movement. This

included active upper limb tasks (primarily reach and grasp during eating/drinking and grooming; manipulation as part of handling money, dressing and writing) but also placement of the arm in relation to the trunk to contribute to global functions including balance, standing from sitting, walking.

This issue was complex: decisions were expressed in relation to client involvement and interwoven with issues around consent. Phase 2 participants cited examples of movements important to a client but beyond their movement capacity without use of compensatory strategies. This formed the basis for negotiating a means of achieving the function which was acceptable for the client and involved movements which were considered by therapists to be least likely to limit future capacity.

Findings of this study extend existing work; the degree of concern expressed by therapists about function related to compensatory movement was influenced by the time since stroke. Maintaining potential for achievement of high quality movement had greater influence on clinical decisions during early recovery when plastic adaption was greatest. In later stages of recovery, the use of compensation to support function was more acceptable to or even promoted by the therapist and focus changed to limiting long term impact. Thus although physiotherapists valued both movement quality and recovery of function this study suggests that clinical decisions were informed by balancing the highest quality movement possible for that client against the functional capacity that movement promoted in both the short and the long term.

Although a small body of work already exists (Raine, 2006; Graham *et al*., 2009) this is related to discussion of the values underpinning the Bobath Concept. This study suggests this issue is core to all therapists and further work should be undertaken exploring how this informs decisions about therapy across the pathway of care for this client group.

6.4.3 Clients' perspective on function

Functional practice (and practise) forms one of the key directives of the RCP guidelines for stroke and is endorsed by dominant therapy paradigms in neurology (Raine, 2006; Graham *et al*., 2009; Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010; ISWP: RCP, 2012). Participant physiotherapists in all stages of the study reported that functional tasks comprised an important part of their practice.

However, interviews with clients in phase 3 provided new perspective on this practice component. In addition to using emerging movement to progress and challenge their functional ability clients with sufficient sensory recovery reported enjoyment of the overall "feeling" of movement. Those who could determine sensory aspects of movement quality (areas identified were in relation to alteration in muscle length and tension and increasing accuracy of movement) enjoyed and valued this aspect of physiotherapy.

In addition to practising functional activities clients described attempts to reproduce this sensory experience outside of physiotherapy. This 'non-functional' movement included stretching, experimentation with their available joint range and movement simply because they enjoyed the feeling of doing so.

This is important because it suggests that clients value therapy that allows them to experience and extend both the sensory and motor parameters of their range and control. This inclusion of non-functional movement in addition to reacquiring function suggests that people recovering from stroke value both quality and quantity of movement. There is little extant work in relation to the value of non-functional activity in treatment of stroke. However, that based on the use of music and rhythm suggests that it facilitates visual awareness in patients with post stroke neglect and induces structural changes in grey matter (Särkämö & Soto, 2012). Recent studies about treatment for Parkinson's disease demonstrated that dancing increased balance parameters for clients (Duncan & Earhart, 2012). This suggests that

novel movement may have transferable effect on the damaged central nervous system and this aspect of movement should be explored in future work.

6.5 Section 4: Interaction between client and therapist

This section includes development of collaboration and the perspective of the client on aspects of treatment.

6.5.1 Collaboration

Collaboration is a key component of person centred care and part of the physiotherapy code of practice (CSP, 2011; HCPC, 2013). Research demonstrates that clients value collaboration but limitations to achievement of this in practice. Extant work identified communication difficulties including lack of inclusion of clients in setting goals (Baker, *et al*., 2000; Parry, 2004; Suddick & DeSouza, 2006) and client perception of power imbalance (Conneeley, 2004; Wohlin Wottrich *et al*., 2004; Proot *et al*, 2007; Rosewilliam, 2011; Schoeb & Bürge, 2011). Therapists and clients agree that communication during and about therapy, including goal setting and collaboration during treatment relies on sharing theoretical and experiential knowledge and that this is difficult (Gattellari *et al*., 2001; Ford *et al*., 2003; Ford *et al*., 2006; Hubbard *et al*., 2008).

Person centred therapy (including gaining informed consent) is based on the premise that client education is a key aspect of therapists' role. Medical and nursing literature provides templates to support client/ professional discussion and frame shared decisions about treatment (see: NHS England, 2015). However, these employ sharing of information and background in a linear manner in the expectation that this will provide a basis for patient education, empowerment and independence which can then inform consent.

Physiotherapy guidelines state that consent should be sought throughout treatment (CSP, 2011) although this is complicated in neurological

physiotherapy practice when treatment involves progression from one area of movement to another. Additionally, this fails to consider an important relationship between consent and collaboration inherent in client physical participation during physiotherapy. Practice described by participants in phases 2 and 3 of this study suggested understanding consistent with the work of Sim (1998) and Edwards *et al*., (2004) which expressed that clients may temporarily cede responsibility regarding decisions where they have less knowledge but retain their control over granting tacit consent through their participation. This was highlighted by physiotherapists in phase 2 regarding the importance of establishing client "embodiment" as part of consent indicated through participating in therapy.

Much existing work considers collaboration during goal setting as a separate process from collaboration during treatment (Hale *et al*., 2003; Conneeley, 2004; Wottrich *et al*., 2004; Levack *et al*., 2006; Melander & Fältholm, 2006; Young *et al*., 2008; Slade *et al*., 2009). This feature of goal setting was also apparent from the findings of phase 2. Therapists linked goals to client centred care and monitoring of practice efficacy and identified limiting factors for patients consistent with extant research including; ability to process language, altered interaction, altered sensory and motor integration and especially awareness and understanding of the indicators regarding recovery (Conneeley, 2004; Wottrich *et al*., 2004; Proot *et al*, 2007; Rosewilliam, 2011; Schoeb & Bürge, 2011). Additionally, findings of phases 2 and 3 supported existing work that clients valued therapists' knowledge base and that therapists valued the information which clients provided regarding their experience of stroke and the impact on their movement and function (Wottrich *et al*., 2004; Slade *et al*., 2009).

However, findings of phase 3 of this study extend existing findings by demonstrating that in addition to overarching goals which informed the entire treatment process the objectives of each treatment session emerged through discussion and collaboration during the interaction. Therapists and clients considered sessions to be therapist led, which matches existing research. However, therapists and clients in phase 3 independently described working

together to construct and deconstruct movement from components of tasks (specific aspects of control) and entire functions.

Therapists' description suggested that the intervention was not considered as a series of "exercises" but as a series of movements building to a whole or starting from a function and reducing to develop specific areas of increased control. These included complex decisions regarding the combining and sequencing of actions i.e. some components were delivered simultaneously (concurrently) and others sequentially (consecutively). Clients' described verbal and physical interaction in order to interpret or extend what they perceived to be the therapists' intentions.

Thus the findings of phase 3 describe how the interaction is informed by both the therapists' knowledge and the clients' feedback. This was most apparent for interactions between experienced therapists and clients with higher levels of sensory and motor return (and thus more awareness and ability to self-select movement). Therapists used information describing the effect of the intervention from the clients' experience and client awareness of movement quality, quantity and control to refine or alter treatment. Additionally, findings from phase 2 and phase 3 suggested that whenever possible the problems addressed were client generated regarding tasks or aspects of tasks which were desirable or challenging to them.

Rather than the linear structure of education and empowerment identified in guidelines participants described a circular structure derived from combining the skills and knowledge of the therapist and the experiences and understanding of the patient. Thus "session level" objectives developed as part of the therapy process rather than being formally identified through discussion. Two related points emerged; this interaction permitted identification or confirmation of the "formal" goals based on shared awareness and that the timing of this discussion could not be defined externally but was part of the physical, emotional and social interaction between therapist and client.

This finding is especially important as existing research identified that clients prefer a process of gradual empowerment and suggest it should relate to time since event, increasing level of motor control and increasing number of options for activity from which to select. The findings of this study suggest that interaction during the therapy process could support this by providing an arena for sharing and conveying information in relation to a client's physical control and agency and thus increase empowerment in a cumulative and controlled manner.

However, data were collected through interview only; future research to explore this area further could also employ analysis of video recording to demonstrate the process of developing treatment through interaction.

6.5.2 Clients' opinion

A number of important issues were articulated by clients in phase 3 of this study which link with existing knowledge about collaboration and clients' involvement in decision making.

Client feedback from this study indicated that those with some sensory recovery were aware of movement quantity (range of movement and function) and quality (comfort and control) and monitored their own motor recovery and change. This linked with a further finding; clients valued time to discuss their movement and explore their own treatment ideas. This may have related to preference to "seek" information at their own pace rather than to be "informed" at the speed that professionals deemed appropriate and if so this is in accord with findings of Wain, Kneebone and Billings, (2008). This may be challenging to service provision; guidelines suggest that in early stages of recovery after stroke 45 minutes of therapy should be offered daily if this can be tolerated. It was identified in section 3.8.3 that many services fail to offer this amount and that clinical decisions may include client prioritisation (McGlinchey & Davidson, 2014). However, despite being derived from a very small group of client participants (n=5) these findings

suggest that incorporating discursive time in addition to movement based therapy should be explored further.

A further interesting finding from phase 3 was that clients' expressed enjoyment of inclusion of movement which they found difficult and challenging in therapy. This contrasts with the suggestion from therapists in phase 2 that movements which clients may "fail" to perform were approached cautiously or avoided during treatment. Clients expressed their wish to collaborate more regarding the extent of challenge within treatment.

These findings need to be interpreted with caution because of the very small group of participants and the variation in sensory and motor return within that group. However, this may be based on an outdated paternalistic model and future research should address this area in greater depth and detail.

6.6 Summary of findings and future directions of related research

6.6.1 Overview

Findings of this study build on those of existing studies which show that physiotherapists use propositional and experiential knowledge to select and evaluate interventions and that decisions are influenced by the client's presentation and the service structure. Delivery of interventions is influenced by collaboration between therapy professionals and between the client and therapist. This study shows that the pathway of assessment, analysis, selection and delivery of an intervention is complex. Physiotherapists derive or construct relationships between information to select assessment content, support understanding of factors influencing patient's movement and deliver interventions which is based therapists' skills and service capacity.

6.6.1.1 Understanding movement control

Existing laboratory based work (Kebaetsie *et al*., 1999; Rohrer, 2002; Cirstea *et al*., 2003; Lo *et al*., 2003; Roby-Brami *et al*., 2003; Rodgers *et al*., 2003;

McClean, 2004; Micera *et al*., 2005; Tyson & Selly, 2006) identified the impact of stroke on movement of the upper limb. This is supported within a clinical context by the findings of this study however stroke presentation may alter during recovery and further work should be undertaken to document this in relation to physiotherapy treatment content and rationale during hyper-acute, acute and long term recovery phases.

Movement control has been shown to be contextualised internally and externally (Shumway Cook & Woollacott, 2011; Kandel *et al.*, 2012; Bear, Connors & Paradiso, 2015). A small body of work demonstrated that the needs of the "entire" person are considered by neuro-physiotherapists in clinical practice decisions (Thornquist, 2001 b; Jull & Moore, 2009). The findings of this study extend this work by identifying that information about the client's sensory and perceptual awareness of their body (internally and externally) was a key component of therapist's reasoning in relation to treatment of the hemiplegic upper limb. Therapists considered client's awareness, understanding and meaning ascribed by them to their body and the impact of stroke into therapeutic assessment and interaction. This area was identified but not explored in depth; further work is therefore indicated.

Although further work is needed the requirement to address this complexity supports the need for experienced and knowledgeable therapists within multi-professional teams for this client group and argument for perspective and collaboration from occupational therapists, speech and language therapists and clinical psychologists.

6.6.1.2 Assessment and reasoning process

Extant studies identified that physiotherapy assessment and treatment is interlinked and proposed models to describe process and rationale within specific areas of neurological physiotherapy (Tyson & DeSouza 2003, McGlynn & Cott, 2007; McGinnis *et al*., 2009). Findings of this study endorse the link between assessment and treatment and extend knowledge by demonstrating a structured spiral approach to decision making about the

hemiplegic upper limb which can be adapted to the presentation and needs of individual clients. Further work should determine if this is applicable to other aspects of stroke rehabilitation and other client groups within neurological rehabilitation.

Existing work initiated definition and tabulation of the content of physiotherapy assessment and treatment for stroke (De Wit, *et al.*, 2006; Donaldson, Tallis & Pomeroy, 2009). This study shows that assessment, analysis, selection and design of intervention are complex. Physiotherapists derive or construct relationships between information to select assessment content, support understanding of factors influencing patient's movement and require skills and capacity to deliver an intervention to address these.

6.1.1.3 Selection of intervention

Physiotherapy to promote movement recovery following stroke involves directing plastic adaption of the CNS through stimulation of the motor and sensory systems (Bosch *et al*., 2002; Cramer, 2008; Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010; Shumway Cook & Woollacott, 2011; Sylvan & Kesselring, 2011; Ward, 2012; Norving, 2014). Historically interventions were based on beliefs related to two paradigms which were considered to be incompatible. However, these approaches are supported by identical neuroscience and recent work identified many areas of similarity between them (Raine, Meadows & Lynch Ellerington, 2009; Carr & Shepherd, 2010). Existing work demonstrated a lack of coherence regarding defining content of the paradigms and suggested that many therapists base their treatment on aspects of both (Davidson & Waters, 2000; Lennon, 2003).

Findings from this study endorsed this and additionally suggested a lack of clarity about the provenance of some aspects of treatment. Further, this study demonstrated variance in descriptive terms used by participants to explain features of stroke presentation and response to therapy. Terminology may indicate (un)conscious alignment to a belief system and underpin

differences in interpretation of assessment findings, this may influence treatment decisions and warrants further investigation.

Work on defining and assessing effect of content associated with named paradigms should continue in order to inform provenance of practice skills. Variation in delivery of interventions based on content of undergraduate and postgraduate teaching could be addressed by closer discussion/affiliation between Universities and the teaching bodies for these treatment systems.

6.6.1.4 Skill mix

Extant work shows that skill mix influences treatment decisions; this was supported by the findings of this study. Indeed, participants identified that level of expertise and professional specificity influenced both treatment selection and delivery. The career structure of physiotherapy through Consultant and Clinical Specialist posts (see: Agenda for Change) acknowledged inclusion of time for highly skilled staff to contribute to developing the skills of other staff members but the findings of this study do not support the transfer of this ideal into practice. This area should be evaluated further in order to support service decisions and professional role/identity. This should include exploring predictive factors about recovery and identifying and evaluating combined (MDT) treatment components which are thought to be most clinically effective.

6.6.1.5 Collaboration

Extant research about therapist/ client collaboration suggest that despite its acknowledged value and key position in person centred care it is difficult to achieve (Baker, *et al*., 2000; Gattellari *et al*., 2001; Conneeley, 2004; Parry, 2004; Wottrich *et al*., 2004; Ford *et al*., 2006; Suddick & DeSouza, 2006; Proot *et al*, 2007; Hubbard *et al*., 2008; Rosewilliam, 2011; Schoeb & Bürge, 2011). Findings from this study support existing research that treatment decisions were therapist led but tentatively suggest that treatment delivery includes shared decisions and collaboration as described by Edwards *et al*.,

(2004). Thus treatment is constructed through synthesis of the propositional information of the therapist and the experiential awareness and feedback of the client. Describing this complex interaction extends perspective on the therapeutic relationship and is pivotal to provision of client centred care; this should be explored further.

6.6.1.6 Clients' opinion

This study extended existing work on client/ therapist collaboration (see: Edwards, 2004) by describing a mechanism through which clients actively contributed to decisions made during treatment. However, some client participants demonstrated desire for greater independence through discussion of their own ideas regarding therapeutically beneficial movement.

Considerable supporting work has been published regarding the value of function in promoting CNS recovery. However, an important finding of this study was the indication that client participant's valued the sensory aspect of movement and independently explored quality and quantity of their emerging movement through functional and non-functional activities.

Work has been initiated exploring music, dance and computer gaming in therapy; this finding supports the need for further exploration. This work should consider inclusion of client ideas and novel movement to facilitate development of collaborative practice and enjoyment of movement. This is in accord with further understanding the role of client /therapist discussion regarding movement.

6.7 Impact of this study

Findings of this study describe some of the influences on decisions made in clinical practice and are in accord with existing work which identified the impact of service structure, skill mix and therapists propositional and experiential knowledge. Areas of existing knowledge about the assessment and reasoning process are extended to describe a spiral approach which

supports a flexible and structured process which can be adapted to the needs of the client. The study endorses and extends existing work that therapists include perspective on client 'embodiment' to inform decision making.

New findings demonstrate collaboration between client and therapist during therapy delivery and describe client desire to contribute to designing the content of therapy. New information suggests that despite guidelines focussed on the value of functional tasks to aid recovery clients' also valued exploration of sensation and non-functional movement.

These findings are relevant for service development, and teaching of physiotherapy at undergraduate, pre-registration and postgraduate levels. They suggest the need to provide opportunities for learning about stroke which develops understanding of presentation rather than recognition of patterns, to engage in team learning which allows professional groups to share knowledge and to increase links between, clinical and education professionals (and students) and people with experience. This is currently limited by geographical distribution of courses; emerging web and interactive technical learning tools could be used to address this.

6.8 Limitations of the study

6.8.1 Limitations inherent in mixed methods research

Despite increasing support for a pragmatic mixed methods approach which is driven by the centrality of the research question there are limitations inherent in this design (Robson, 2002). Chief amongst these are skills and training; requiring the researcher, or research team to have awareness of both quantitative and qualitative research methods, data analysis and interpretation (Robson, 2002; Teddlie & Tashakkori, 2009). The supervision team for this project included experts in quantitative and qualitative methodologies and the support provided was intended to address this limitation (see: methods section chapter 2). However, data was gathered and

analysed by the primary researcher who is a novice, this may have influenced the quality of the data gathered and the depth of the analysis.

Explicit rationale for combining both research methodologies should be provided in order to demonstrate what has been gained by employing a multi-method design. The degree of integration of the findings may limit their separate value. Mason (2006; cited in Robson, 2002) suggests that if poorly executed this design may produce disjointed and unfocused research.

Within this study the primary research methodology was qualitative although the rationale for employing mixed methods was discussed (see section 2.4) and the findings of both components integrated in the final discussion (see chapter 6). However, the quantitative component of the study provided both a basis for the design of the qualitative sections and context for the overall research findings. These are therefore limited by the scope of the initial phase (see section 3.3.2).

6.8.2 Participants

The validity of the findings of quantitative studies is based on probability sampling which employs mathematical estimate of the generalisability of the findings based on the number of responses reported and thus the extent to which the results represent the characteristics of a population. Data derived from a prescribed number of cases is required to represent the characteristics of the population within a calculated margin of error (Teddlie & Tashakkori, 2009; Leung, 2015). Robson (2002) suggested that only a "high" response rate can be considered representative and therefore produce valid findings. Characteristics of the "non-returners" are at best "unknown" but may equally indicate a difference from the returners which the researcher cannot report. The return rate for the questionnaire employed in phase 1 was only 10% (n=143) which limits the validity of the findings because it cannot adequately represent the population of physiotherapists working in stroke rehabilitation. The data derived should therefore be interpreted with great caution and used only to indicate broad aspects UK practice within delivery

for physiotherapy after stroke. A larger number of returned surveys would have been needed to describe and explore the issues more completely.

Qualitative studies employ purposive selection of a relatively small number of participants included because they can provide particularly valuable information related to the research question under examination (Teddlie & Tashakkori, 2009; Leung, 2015). The population for phases 1 and 2 was drawn from members of ACPIN, this was done in order to access physiotherapists across the UK with experience in treating stroke but the data collected may be incomplete if there are characteristics, (for example experiences, beliefs and opinions) which are common only to neurological physiotherapists who are members of ACPIN. Additionally, most of the contacts from the ACPIN membership list worked in NHS provision in England.

Further studies including physiotherapists working with the same client group but who are not ACPIN members may reveal interesting areas of comparison. Work should also include a wider and more equal balance between therapists' geographical location and working in non-NHS stroke services.

6.8.3 Study design

6.8.3.1 Questionnaire design

Phase 1 data was gathered via questionnaire, Carter, Lubinsky & Domholt (2011) advises that the use of an existing questionnaire permits the researcher to build on previous work. However, the information collected was specific to the needs of this study and a questionnaire was therefore developed by the researcher and such items should be subjected to expert review and piloted several times (Carter, Lubinsky & Domholt, 2011).

Although the study questionnaire was reviewed and piloted, this was undertaken by a small number of clinical and academic colleagues who had background knowledge of the purpose of the questionnaire. This may have

influenced their criticality. Additionally, these individuals worked in the same geographical area and may have overlapping knowledge and experience. This might have limited suggestions to improve content.

Robson (2002) identified a number of design aspects which may limit survey based studies and could have affected results of this study. Questions provided pre-determined options from which respondents were asked to select but no means of expanding on their selected response to provide greater detail. Respondents could omit questions but could not indicate their reason for omission or preferred answer. Further Robson (2002) points out that data may be affected by respondent characteristics including memory, knowledge and the accuracy with which they answer the questions.

6.8.3.2 Interviews

Data collection during Phases 2 and 3 was based on interviews. These were carried out over a short time frame (phase 2: 12 weeks; phase 3: 4 weeks) during which the researcher's familiarity with the process developed. Robson (2002) notes that data collected through telephone surveys may be affected by characteristics of the interviewer including their personality, skills and experience and it is possible that the researcher unwittingly provided verbal cues of affirmation which affected the information which participants shared. Additionally, when interviews were conducted on the same day the responses to the first interview may have unconsciously influenced the conducting or the discussion in the second. Further as Phase 2 data was collected through telephone interviews and there was no observer during phase 3 it was not possible for field notes of non-verbal communication to be recorded which omitted a potential data source for triangulation.

6.8.3.3 Insider research

Although my clinical role requires communication with clients and other staff research interviews demand different skills and care with respect to difficulties associated with Insider Research (discussed in Chapter 2). Data

provided could be influenced by phase 2 participants' perception of the researcher as a fellow neuro-physiotherapist and by phase 3 participants as a colleague (Denzin & Lincoln, 2005).

Care was taken to structure interview questions and prompts, however as a novice researcher it was difficult to create an ambience in which physiotherapy participants felt comfortable to share information, which encouraged reflection rather than clinical discussion and maintained my role as an objective participant and not a confidante (Morgan, 2014).

Equally clinical conversations with clients generally involve information provision rather than opinion seeking and care was needed to avoid over-prompting or assisting those who were trying to find a precise expression. Physiotherapy participants shared information with minimal direction or prompting but some client participants said more than others and care had to be taken not to over-represent those participants in the analysis.

6.8.3.4 Sole research

As a sole researcher I was responsible for the data collection and analysis. My clinical awareness may have contributed positively to identifying clinically relevant codes (Denzin & Lincoln, 2005). However, the rigour of the study is affected by lack of discussion to verify the data and review the categories with another person. This has been addressed as much as possible by provision of an audit trail to demonstrate the coding process (Appendices xi;xviii).

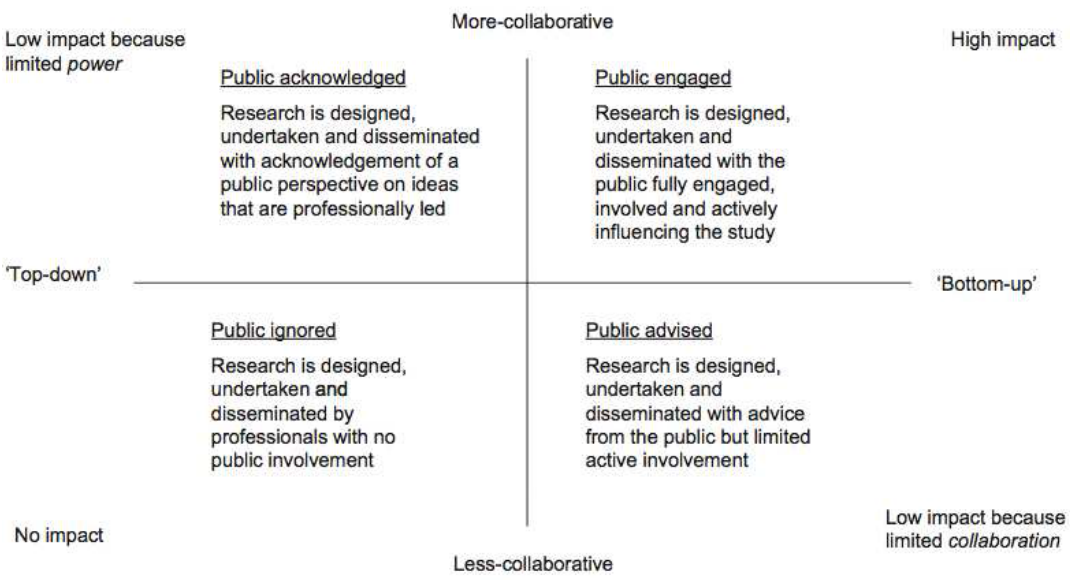
6.8.3.5 Client inclusion

This study aimed to explore physiotherapists' clinical decisions about treatment of the hemiplegic upper limb. Client centred care and extant work (Edwards, 2004) suggests that physiotherapy includes collaboration between the client and the therapist, although existing work suggests that involving clients in decisions is difficult in practice (Conneeley, 2004; Hubbard *et al*.,

2008; Rosewilliam, 2011; Schoeb & Bürge, 2011). A considerable body of work suggests that clinical relevance of health research is increased by including the unique perspective of people who use the services (Fudge et al., 2007; Hogg 2007; Boote et al., 2010) however little work exists to demonstrate processes supporting this facet of therapeutic interaction. Exploration of this aspect of clinical decisions by this study was limited by the small number of participants (physiotherapists and clients) and the inclusion of clients in the third phase only.

Robinson, Newton & Dawson (2012) developed a model describing the impact of studies with differing levels of client participation (see figure 6.4).

Figure 6.4: A conceptual model for evaluating and reporting the impact of public involvement in health research (Robinson, Newton & Dawson, 2012).



On reflection this study was designed and implemented with limited public (client) involvement except participation in providing data during the final phase. Physiotherapists' involvement was restricted to consultation with a small number of people in the design of the phase 1 questionnaire and the wording of the questions for phases 2 and 3. There was no consultation prior to conducting the study and although a methodological decision was made to avoid participant validation (member checking) of emerging themes no other

opportunity was provided for participant feedback or discussion of emerging themes.

Thus the study was conducted with minimal engagement from the two groups who would have provided the greatest insight and perspective into the main areas of focus and is acknowledged as having “low impact” (Robinson, Newton & Dawson, 2012). This is acknowledged as learning experience for the researcher and advice will be sought during dissemination of findings in order to provide future work with a stronger foundation and greater impact and relevance.

Finally, data collected in phase 3 was from a single service within a specific NHS Trust; this limits the scope of the findings and they cannot be considered valid for any other service or client group. Future work should explore client and carer perspective regarding upper limb treatment throughout the entire pathway of care in addition to engaging a larger number of clients in future video based research of a range of therapeutic interactions addressing treatment of their hemiplegic upper limb.

Despite these limitations this study has increased understanding of treatment decisions in an important area of physiotherapy practice. Findings extend existing work regarding the influence of service structure on clinical decisions by documenting how decisions about content and focus of treatment are influenced by staffing, variation in skill mix and clinical expertise. Further this thesis increases understanding of the impact on physiotherapy treatment when working with other professional groups.

This thesis makes an original contribution to knowledge by demonstrating the rationale underpinning flexibility in the structure of physiotherapy assessment and how therapists derive and interpret information in order to support treatment decisions.

Finally, this thesis demonstrates the process through which clients and therapists collaborate to explore movement and make decisions. Original findings suggest that treatment objectives are wider than previously

acknowledged. In addition to functional gain clients' value sensory experiences of non-functional movement and therapists' decisions are supported by awareness of the physical, social and emotional needs of the entire person.

The findings have been used to support recommendations for future work in this area.

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Appendices

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Appendix i:

Phase 1 Questionnaire

Questionnaire Phase 1.

Thank you very much for completing this questionnaire, which relates to physiotherapy for clients with hemiplegia following stroke. Please feel free to omit any questions which you do not feel comfortable answering.

If you do not **currently** treat clients who have had stroke would you indicate below but still return the questionnaire by email to gillian.m.bamborough@northumbria.ac.uk or in the envelope provided.

I DO NOT CURRENTLY TREAT CLIENTS WHO HAVE HAD STROKE ☐

A. YOUR BACKGROUND

			Please tick all that apply	Coding for SPSS
1.	To which of the following age groups do you belong?	21-30	☐	1a
		31-40	☐	1b
		41-50	☐	1c
		51-60	☐	1d
		Over 60	☐	1e
2.	How long have you been qualified as a physiotherapist?	0-5 years	☐	2a
		6-10 years	☐	2b
		11-20 years	☐	2c
		21-30 years	☐	2d
		31-40 years	☐	2e

	More than 40 years	☐	2f
3. What are your qualifications? (please tick all that apply)	Diploma or Graduate diploma in physiotherapy	☐	3a
	BSc (Hons) physiotherapy	☐	3b
	Pre-reg MSc Physiotherapy	☐	3c
	Postgraduate MSc Physiotherapy	☐	3d
	Other degree (Please Specify) ……	☐	3e
4. How many years in total (including your current post) have you worked in neurological rehabilitation?	0-5 years	☐	4a
	6-10 years	☐	4b
	11-20 years	☐	4c
	21-30 years	☐	4d
	31-40 years	☐	4e
	More than 40 years	☐	4f

5. How long have you worked in your current post?	0-5 years		5a
	6-10 years		5b
	11-20 years		5c
	21-30 years		5d
	31-40 years		5e
	More than 40 years		5f

6. What is your current grade?	8a		6a
	8b		6b
	8c		6c
	7		6d
	6 (rotational)		6e
	6 (static)		6f
	5 (rotational)		6g
	5 (static)		6h

B. YOUR POST GRADUATE EXPERIENCES AND INFLUENCES

7. In the past 5 years which, if any of the following neurological physiotherapy courses have you attended? (please indicate all that apply)

Bobath weekend course	☐	7a
3 weeks Basic Bobath course	☐	7b
Advanced Bobath course	☐	7c
Motor relearning	☐	7d
PNF	☐	7e
Massage	☐	7f
Vestibular rehabilitation	☐	7g
Hydrotherapy	☐	7h
Other (Please specify) …….	☐	7i

8. Within the past 5 years has attendance of a neurological physiotherapy course influenced the type of treatments you include in your practice?

completely	a lot	partially	very little	not at all	
☐	☐	☐	☐	☐	8a
					8b
					8c
					8d
					8e

9. Within the past 5 years has attendance of a neurological physiotherapy influenced the way you deliver the treatments you include in your practice?

completely	a lot	partially	very little	not at all	
☐	☐	☐	☐	☐	9a
					9b
					9c
					9d
					9e

10. Please expand on how attendance of a neurological physiotherapy course has infuenced your practice, if at all 10a

11. Within the past 5 years has attendance of a non-neurological physiotherapy course influenced the type of treatments you include in your practice?

completely	a lot	partially	very little	not at all	
☐	☐	☐	☐	☐	11a
					11b
					11c
					11d
					11e

12. Within the past 5 years has attendance of a non-neurological physiotherapy course influenced the way you deliver the treatments you include in your practice?

completely	a lot	partially	very little	not at all	
☐	☐	☐	☐	☐	12a
					12b
					12c
					12d
					12e

13. Please expand on how attendance of a non-neurological physiotherapy course has infuenced your practice, if at all. 13a

14. Within the past 5 years has a piece of published research influenced the type of treatments you include in your practice?

completely	a lot	partially	very little	not at all	
☐	☐	☐	☐	☐	14a
					14b
					14c
					14d
					14e

15. Within the past 5 years has a piece of published research influenced the way you deliver the treatments you include in your practice?

completely	a lot	partially	very little	not at all	
☐	☐	☐	☐	☐	15a
					15b
					15c
					15d
					15e

16. Please expand on how a piece of published research has infuenced your practice, if at all 16a

C. <u>YOUR WORK</u>

17. What kind of environment do you currently work in?(please tick any answers which apply)

Hospital medical wards	☐	17a

	Hospital care of the elderly wards	☐	17b
	Hospital acute stroke unit	☐	17c
	Stroke Rehabilitation unit	☐	17d
	Stroke early supported discharge team	☐	17e
	Community stroke team	☐	17f
	Hospital out patients Dept	☐	17g
	General Community team	☐	17h
	Other Please specify ……	☐	17i

18. Please use the numbers 1, 2 and 3 to indicate the 3 groups which make up the largest proportion of patients you currently treat. With 1 to indicate the largest group, 2 the second largest and 3 the third largest.	Stroke (CVA)	☐	18a
	Multiple Sclerosis	☐	18b
	Parkinson's Disease	☐	18c
	Acquired brain injury	☐	18d

Spinal cord injury (complete or incomplete)		18e
Adults with Cerebral palsy		18f
Other client group Please specific y …… ……		18g

19. Are there other rehabilitation staff members working with you in the same environment?
Please indicate how many staff members of each grade, including part time staff.

	Physiotherapists	
8a		19a
8b		19b
8c		19c
7		19d
6 (rotational)		19e
6 (static)		19f
5 (rotational)		19g
5 (static)		19h
TI's (band 3 and 4)		19i
Assistants (band 2)		19j

	Other MDT members	
Occupational therapists		19k
Speech and language therapists		19L

Specialist nurses	☐	19m
Other staff (please specify) ……	☐	19n

D. PATIENTS WHO HAVE HAD STROKES AND THEIR TREATMENT

20. How many **different** clients who have had a stroke do you personally treat in a week? If the same client receives treatment more than once a week please only count this client once.

0-5	☐	20a
6-10	☐	20b
11-20	☐	20c
21-30	☐	20d
31-40	☐	20e
More then 40	☐	20f

21. How long would you usually spend hands-on in a typical treatment session for clients who have had a stroke? Please indicate maximum and minimum values if one time frame does not represent your case load

0-15 mins	☐	21a
16-30 mins	☐	21b
31-45 mins	☐	21c
46-60 mins	☐	21d
More than 60 mins	☐	21e

22. Do you usually treat clients who have had a stroke on your own?

always	usually	often	sometimes	never	
☐	☐	☐	☐	☐	22a
					22b
					22c
					22d
					22e

23. If you needed to treat a client with another member of the physiotherapy staff please indicate who would be available to work with you.

Never work with another member of physiotherapy staff	☐	23a
Physiotherapist of a higher grade	☐	23b
Physiotherapist of the same grade	☐	23c
Physiotherapist of a lower grade	☐	23d
Technical instructor	☐	23e
Physiotherapy Assistant	☐	23f
Other (Please specify) …… …….	☐	23g

24. Would your treatment be modified in relation to which other member of staff is able to assist?

always	usually	often	sometimes	never	
☐	☐	☐	☐	☐	24a 24b 24c 24d 24e

25. If appropriate please briefly explain in what way your treatment would be modified in relation to which other member of staff is able to assist? 25a

E. TREATMENT OF THE ARM AFTER STROKE

26. Within the post stroke client group you current treat please indicate how frequently your clients experience the following problems in the hemiplegic arm

	always	usually	often	sometimes	never	
Pain	☐	☐	☐	☐	☐	26a i,ii,iii,iv,v
Reduced muscle activity/tone	☐	☐	☐	☐	☐	26b i,ii,iii,iv,v
Increased muscle activity/tone	☐	☐	☐	☐	☐	26c i,ii,iii,iv,v
Movement with altered pattern	☐	☐	☐	☐	☐	26d i,ii,iii,iv,v
Movement with altered range	☐	☐	☐	☐	☐	26e i,ii,iii,iv,v
Reduced coordination	☐	☐	☐	☐	☐	26f i,ii,iii,iv,v
Reduced proprioception	☐	☐	☐	☐	☐	26g i,ii,iii,iv,v
Reduced grip	☐	☐	☐	☐	☐	26h i,ii,iii,iv,v
Reduced sensation	☐	☐	☐	☐	☐	26j i,ii,iii,iv,v
Altered sensation	☐	☐	☐	☐	☐	26k i,ii,iii,iv,v

	always	usually	often	sometimes	never	26L i,ii,iii,iv,v
Neglect	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	26m i,ii,iii,iv,v
Shoulder subluxation	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	26n i,ii,iii,iv,v
Mal-alignment of other upper limb Joint	☐	☐	☐	☐	☐	
Other (Please specify) ……..	always ☐	usually ☐	often ☐	sometimes ☐	never ☐	26p i,ii,iii,iv,v

27. Please indicate how often you would use the following as part of a treatment for **the hemiplegic arm after stroke**

	always	usually	often	sometimes	never	27a i,ii,iii,iv,v
Facilitatory handling/Bobath	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27b i,ii,iii,iv,v
Inflatable splinting (Margaret Johnston technique)	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27c i,ii,iii,iv,v
Motor relearning (Carr and Shepherd)	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27d i,ii,iii,iv,v
Postural training (for example scapula setting)	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27e i,ii,iii,iv,v
Proprioceptive Neuromuscular Facilitation	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27f i,ii,iii,iv,v
Massage	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27g i,ii,iii,iv,v
Muscle Stretching	☐	☐	☐	☐	☐	

	always	usually	often	sometimes	never	27h i,ii,iii,iv,v
Joint mobilisation	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27j i,ii,iii,iv,v
Strengthening	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27k i,ii,iii,iv,v
Strapping/taping	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27L i,ii,iii,iv,v
Sensory stimulation	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27m i,ii,iii,iv,v
Functional activity	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27n i,ii,iii,iv,v
Constraint therapy	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27p i,ii,iii,iv,v
Functional Electrical Stimulation	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27q i,ii,iii,iv,v
Gym (Swiss)ball	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27r i,ii,iii,iv,v
Hydrotherapy	☐	☐	☐	☐	☐	
	always	usually	often	sometimes	never	27s i,ii,iii,iv,v
Other (Please specify)	☐	☐	☐	☐	☐	

……

……..

28. Please indicate to what extent the following influence your choice of treatment for the hemiplegic arm after stroke

My theoretical knowledge	completely	a lot	to some extent	very little	not at all	28a i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
My clinical experience	completely	a lot	to some extent	very little	not at all	28b i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
In-service training	completely	a lot	to some extent	very little	not at all	28c i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Post graduate courses	completely	a lot	to some extent	very little	not at all	28d i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Research published in journals	completely	a lot	to some extent	very little	not at all	28e i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Information published in books	completely	a lot	to some extent	very little	not at all	28f i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Information from attending conferences	completely	a lot	to some extent	very little	not at all	28g i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Government policy	completely	a lot	to some extent	very little	not at all	28h i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Professional guidelines	Completely	A lot	to some extent	Very little	Not at all	28j i,ii,iii,iv,v
	☐	☐	☐	☐	☐	

Hospital protocols	completely	a lot	to some extent	very little	not at all	28k i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Advice from other staff members	completely	a lot	to some extent	very little	not at all	28L i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Patients suggestions/feedback	completely	a lot	to some extent	very little	not at all	28m i,ii,iii,iv,v
	☐	☐	☐	☐	☐	
Other (Please specify) …… ……	completely	a lot	to some extent	very little	not at all	28n i,ii,iii,iv,v
	☐	☐	☐	☐	☐	

Any further comments

……
……
……
……
……
……

☐ Please tick the box if you would be prepared to participate in an individual interview of a maximum of 30 minutes on treatment of the arm after stroke (please provide your name, email address and/or a contact telephone number so that a time convenient for you can be arranged)

……
……
……
……
……
……

Thank you very much indeed for your time and effort in completing this questionnaire. Would you return it by email to:gillian.m.bamborough@northumbria.ac.uk?

Appendix ii:

Ethical approval

Health Research Authority

NRES Committee London - City Road & Hampstead
Bristol Research Ethics Centre
Level 3, Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Telephone: 0117 342 1330
Facsimile: 0117 342 0445

10 May 2012

Ms Gillian M Bamborough
Lecturer/Practitioner in physiotherapy
City Hospitals Sunderland Foundation Trust.
Physiotherapy Dept, Sunderland Royal Hospital,
Kayll Road, Sunderland.
Tyne and Wear.
SR4 7TP

Dear Ms Bamborough

Study title:	**An investigation of the content,rationale and interaction between the physiotherapist and the client during delivery of a clinical intervention for rehabilitation of the hemiplegic upper limb following stroke.**
REC reference:	**12/LO/0819**
Protocol number:	**N/A**

The Proportionate Review Sub-committee of the NRES Committee London - City Road & Hampstead reviewed the above application on 09 May 2012.

Ethical opinion

On behalf of the Committee, the sub-committee gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

3rd April 2013

Ms Gillian Bamborough
Physiotherapist

Dear Ms Bamborough

Study Title: An Investigation of the Content, Rationale and Interaction Between the Physiotherapist and the Client Durig Delivery of a Clinical Intervention for Rehabilitation of the Hemiplegic Upper Limb Following Stroke

REC Reference: 12/LO/0819
R&D Reference: 13 - 15

Thank you for your recent application for Trust approval. Approval has now been granted for the research to be carried out within .

Study sponsor: Northumbria University

Site Specific Assessment has been undertaken by Research and Development

Please note it is a requirement of the approval given by the Trust that the research project is being conducted in line with the guidance given within the Research Governance Framework as issued by the Department of Health. As chief/principal investigator you should be aware of and have a duty to comply with the Research Governance Framework (www.doh.gov.uk/research) throughout the duration of the research. We also draw your attention to the need to comply with all relevant legislation including for example the Health and Safety at Work Act, the Data Protection Act and the Human Tissue Act 2004.

This project has been registered on the Trust research database and you should keep the R&D team informed of your progress. In particular the R&D department must be notified of;

- Commencement and completion of the study
- Any significant changes to the study design as submitted to the Medicine and Health Regulatory Authority and Research Ethics Committee
- Any changes to research teams

Appendix iii:

Participant information phase 1: letter and information sheet

Gillian Bamborough

Senior Lecturer in Physiotherapy

Northumbria University

Coach Lane Campus

Benton

Newcastle upon Tyne

NE7 7XA

Dear ACPIN member,

My name is Gillian Bamborough. As part of the requirements of my Professional Doctorate in Physiotherapy in the School of Health, Community and Education at Northumbria University I am conducting a research study. I would like to explore the clinical decisions made by physiotherapists during treatment of a client's hemiplegic arm following stroke, and I would like to invite you to participate in this study. The study will be in three phases of which this is the first.

Before you decide if you would like to participate we would like you to understand why the research is being done and what it would involve for you.

Part 1 of the enclosed Information sheet tells you about the purpose of this study and what would be involved if you take part. Part 2 gives you more detailed information about the conduct of this study.

If you have any questions or concerns, or would like further information, please do not hesitate to contact me at: Gillian.Bamborough@northumbria.ac.uk: 0191 2156328 or my university supervisor Professor Nicola Adams, Professor in Allied Health, Northumbria University (Nicola.Adams@northumbria.ac.uk: 0191 2156620).

Thank you for considering taking part.

Gillian Bamborough

Information Sheet for Physiotherapists (Phase 1)

Research Study Title:
Interaction between the physiotherapist and client following hemiplegic stroke.

This study has been reviewed and approved by the City Road and Hampstead Research Ethics Committee.

REC Number: 12/LO/0819

Phase 1:
An exploration of the potential content of physiotherapy for rehabilitation of the hemiplegic upper limb following stroke.

Part 1.

What is the study about?

This study aims to:

- Explore the rationale supporting selection of specific physiotherapy interventions for rehabilitation of the hemiplegic arm following stroke.
- Explore the interaction between therapist and client during the delivery of an intervention for rehabilitation of the hemiplegic arm following stroke and if this influences the clinical decisions made by the therapist during the intervention.

This is the first phase of the study and is an exploration of physiotherapists' perception of the potential content of physiotherapy interventions for rehabilitation of the hemiplegic arm following stroke.

Why is it being done?

Government policy and professional guidelines require physiotherapists to deliver interventions which are: evidence based, functionally relevant and client centred. Existing research suggests that clinical decisions made during physiotherapy for rehabilitation of the hemiplegic arm after a stroke requires consideration of: the rationale supporting the choice of intervention, specific components of physiotherapy practice and how the intervention is delivered. However information detailing the relationships between these factors is

sparse and existing work identifies the need for further investigation; this study aims to identify and explore some of these relationships.

Why have I been asked?

You have been asked to consider participating in this research because it requires the involvement of a number of Physiotherapists currently working in neurological rehabilitation.

What am I being asked to do?

If you decide to participate, you will be asked to complete a questionnaire about the treatment which you would consider for rehabilitation of a client's hemiplegic arm after stroke. The questionnaire should take no more than 15 minutes to complete and can be returned in the enclosed envelope or by email. A small number of respondents will also be invited to participate in a short (telephone) interview/discussion in order to expand on the information they provided in completing the questionnaire. There is a section on the questionnaire where you can indicate if you would be prepared to participate in such an interview/discussion; if you would prefer to simply complete the questionnaire but not to participate in an interview/discussion please feel free to omit that section of the form.

What happens if I do not want to participate?

The choice to participate is completely voluntary and entirely up to you. If you do not wish to complete the enclosed form please ignore this letter: you will not be contacted further.

What are the possible benefits of taking part

Although you won't benefit directly from participating in this study, we hope that the information provided will benefit clients who have experienced stroke affecting movement of their arm.

Will the information I provide be kept anonymous?

Yes. The proposal for this study has been approved and passed by the Ethics Committee for Northumbria University School of Health, Community and Education. We will follow ethical and legal practice and all information about you will be handled in confidence. Confidentiality, anonymity, and privacy will be ensured throughout the collection, storage, final report writing and publication of research material relating to this study.

This completes part 1. If the information in part 1 has interested you and you are considering participation, please read the additional information in part 2 before making any decision.

Part 2.

What will happen to the data that is gathered?

The questionnaires and transcripts of the interviews will be allocated numerical identification and the answers will not be attributable to any respondent. All information will be stored within a locked cabinet and data derived from the questionnaires will be kept in password-protected files. All data will be kept in these secure conditions until completion of the project, after which they will be destroyed in accordance with Northumbria University policies for handling confidential material.

What will happen to the results of the research study - how will the research report be disseminated?

The outcomes of the research will generate part of the basis of the dissertation for my professional doctorate award. It is anticipated that the finding of the research will be disseminated in peer reviewed journals and at relevant conferences.

What next?

If you would be willing to participate in this study, the next stage is to complete and return the attached questionnaire in the envelope provided, or by e-mail if this is more convenient for you.

Who do I contact if I have any questions?

If you have any questions or concerns, or would like further information, please do not hesitate to contact me at: Gillian.Bamborough@northumbria.ac.uk: 0191 2156328 or my university supervisor Professor Nicola Adams, Professor in Allied Health, Northumbria University (Nicola.Adams@northumbria.ac.uk: 0191 2156620).

Please feel free to retain this information sheet

Thank you for considering taking part.

If you would like to participate, please open the attached survey packet and begin completing the questionnaire. When you have finished please use the enclosed envelope to return the questionnaire.

Gillian Bamborough

Appendix iv:

Themes related to attendance on neurological post graduate courses

	Theme		Subtheme
T1	Increased theoretical knowledge	A	Increased knowledge/ understanding of neurological theory
		B	Increased ability to make theory: practice links
		C	Improved clinical reasoning
T2	Application of research into practice	A	Current-ness of research knowledge
		B	Application of evidence based practice
		C	Reflection
T3	Increased skill	A	Improved skill of assessment
		B	Improved delivery of existing areas of competence
		C	Development of new skills
T4	Increased range of practice		
T5	Networking		

Theme	Sub-theme	
T3	B C T4	The CIMT course allowed me to feel confident to deliver a treatment I had previously only read about. The bridges course cemented self-management principles that I felt I was already using as part of my practice
T3	A B	Bobath course improved observation skills and gave some useful pointers for handling the neurological patient
T1 T2	A A	Increased my ability to analyse literature, increased knowledge of neuro anatomy and physiology
T2 T4	C	It has given me more options for treatment and made me think about the treatments I select more carefully
T5		Seeing others work, networking, exchanging ideas
T3	B	Of the courses I have attended I have been able to relate the treatment approaches to patients I am currently treating and trial them. I usually try to do this but if there is a lot of information to go over and understand this makes it more difficult

T3	A B	Gave me points to consider when assessing and treating hemiplegic upper limb particularly in terms of 24 hour management and a carful need when physically handling patient
T1 T3	C B	Improved handling and clinical reasoning
T1	A C	Gives you knowledge of assessment and treatment methods. Also improves clinical reasoning
T3 T4	C B	Connective tissue and fascia course means that I use massage more. Cognitive sessions at complex case management course taught me to improve the strategies I use to help memory and cognitive problems I would use saeboflex more if I had suitable clients funding is an issue in private practice.
T4		Made me aware of other treatment types that can be used and also other services that are available to patients to aid their rehabilitation. I also think attending a course helps motivate me so that I don't get into a rut in my professional practice
T1	A B	Expanded knowledge base on further reaching effects of stroke. Additional skills and application of theory into practice
T3	A C	Techniques for assessment and treatment of balance problems as a result of courses including a couple with Anne Shumway Cook and specific Parkinson's Disease Lectures
T1 T3	A B	Increased appreciation for normal movement and increased use of effective handling techniques
T4		Putting ideas into practice eg manual therapy, upper limb activation, new techniques .I use FES for shoulders now
T1 T2 T3 T4	A B A B B	MSc provided a wealth of evidence based practice, I was able to improve my handling techniques and improve my knowledge of stroke and spasticity management. A splinting course refined my scotch and soft splinting technique
T3	B	More confidence in practical skills used following Bobath course
T2 T4	B	By looking at evidenced based treatment and also methods of delivery have changed my practice to suit
T4		CIMT COURSE, USA CIMT tutors, purely reinforces motor relearning, hard core exercise is only way forward
T1 T3	A B	Improved handling skills backed up by theoretical knowledge
T4		More proactive with saebo and clients to use on own between sessions of specific treatment FES for assessment and use to improve gait and muscle
T4		Change in treatment techniques
T4		Less emphasis on controlling tone and more on muscle strengthening…including use of saeboflex
T3	B	Different awareness to my hands on techniques
T2 T4	B	Applied new skills eg splinting, promoted critical analysis of existing practice
T4		Helped me to blend approaches to deliver better patient centred care
T2 T4	B	New ideas for treatments or evaluating previous techniques in light of evidence
T1	A	Main influence has been to try and change methods of treatment to reflect changes in neurophysiology understanding

T3 T4	B	Introduction to Bobath Course taught me to incorporate facilitated movement and hone my positioning skills. Primitive reflex course I use pathway for desensitising tendon guard/ babinksi reflexes that (cannot read word) gait I have just started to incorporate some myofascial release for my Parkinson's patients
T2 T4	B	New treatment ideas and evidence regarding treatment methods
T3 T4	C	Different assessment treatment and handling methods to use with stroke patients
T2 T3 T4	B B	Think about evidence based practice more. Improved awareness of handling of patients increased emphasis on patient goals and patients taking more control of treatment and physio
T5		Through updating ideas, networking, watching patient treatments, discussion sparking off more thinking
		Just very directly and simply you learn something agree with it or are convinced and act accordingly
T4		Expanded repertoire
T4		Motor relearning- really helped me make my tasks very objective- helping the service user to see their own progression as well as myself
T2 T3	A B	Basic Bobath course has influenced my planning of treatment sessions, use of equipment, handling skills. I use VR course regularly with VR patients but also knowledge from my own reading and MSc
T3 T4	C	Can now make my own splints instead of referring or buying Use outcome measures all of the time now
T1 T3	B B	Practical application of neuroplasticity , handling techniques, postures to treat in
T3	B C	It has shown me new ways of handling patients and given me the confidence to try techniques I had previously read about
T2	C	Attending courses encourages you to reflect on practice and how making small changes may impact on this
T3	C	New techniques
T1 T3 T4	C C	Handling, clinical reasoning, choice of intervention
T1 T3	B C	Handling and facilitation techniques, also theoretical frameworks to underpin practice
T1 T3 T4	B A	Provided theoretical basis , provided treatment ideas, encouraged clinical reasoning, improved assessment techniques
T4		Emphasis on compliance with home exercise less influence from Bobath course
T4		Consideration of sensory function of upper limb interaction of tone within postural control with core stability
T4		Attendence at the Saeboflex Course …. and the purchase of the kit by my employers has influenced my choices for upper limb rehab.
T3 T4	A B	Use Saebo a lot recently, Bobath handling skills and analysis of movement
T1 T2	C A	Provide knowledge of current research Occasionally good tips for clinical reasoning

T4		I have a greater variety of tools to use depending on what the patient needs. As I work in the community I can use some of these adjuncts to treatment to enable more independent practice of movement and tasks, while I can still use facilitation techniques in my one to one sessions
T3 T4	C	Given new ideas for treatment
T1 T4	C	higher level clinical reasoning. greater set of physical treatment skills to use
T1 T3	B C A B	Developed clinical reasoning around treatment approaches, improved handling techniques, improved understanding of effect of treatment on neurophysiology, improved ability to relate early treatment and ongoing treatment approaches to both patient function and optimal movement patterns, increased autonomy in practice.
T4		More selective exercise programme for vestibular patients confidence to increase the number of treatment sessions for outpatients
T2	A	Advanced Bobath v disappointing for community work. Motor relearning more applicable. Latest treatment modalities eg CIMT very useful from MSc module.
T1 T2 T3 T4	C C A	Attendance of advanced Bobath course has led to more in depth movement analysis and clinical reasoning. it has also enabled me to make up my own mind about the strengths and limitations of the Bobath approach. Functional strength training course has led to me being more dynamic in treating patients and setting home exercises. This has particularly helped me to treat high level patients and I feel this approach has filled in some of the gaps of working to a purely Bobath approach
T3	A B	Reinforced the need to ensure adequate preparation is done to achieve the desired effect and the importance of taking time to assess and reassess.
T2 T4	B	Provide new ideas of treatments techniques and evidence for why this treatments are beneficial
T4		Better awareness of service development, awareness of practice in different regions but also countries and how we can learn from other service set ups.
T1	B	More awareness of how handling can influence recovery
T1 T3	B C	By including new ideas/ skills into the practice and getting results after their implication has changed my thinking and handling particular type of disability in stroke patients.
T1 T2 T3	C C B	It is a slow process but each course has helped me to improve handling skills and clinical reasoning
T4		Facilitatory handling/movement is not necessarily the only way to access movement
T4		CIMT, MI using in practice
T3	A C	Spend more time completing observational analyses Spend more time looking at sensory stimulation

T4		Encouragement to self-generated exercise eg gym attendance. More proactive in self-management
T1 T4	C	Broadening my thought processes to include patients learning in practice, developing control exercises with decreasing external cueing (person/environmental) to increase patients functional ability.
T4		Use of different techniques to help with increased activity in the water
T2	C	Courses may shape practice but rarely radically changes it
T1	A C	Expands my knowledge, understanding and outcome of what i do with patients
T1 T2	B B	With increasing evidence base and good theory - practical link provided in the course, it demonstrates an approach which works clinically
T4		Rehab is now more functional, less hands on and use more problem solving approaches for enhanced motor relearning. Also use new treatment techniques such as mirror therapy, constraint therapy etc
T2	A	It has provided me with up to date current knowledge on that particular treatment modality.
T3	C	Application of treatment / handling techniques
T2	B	More aware of evidence based practice and try to apply where possible
T2 T3	B B	evidence based and structure development of personal clinical skills
T3	B	Consolidated treatment approaches and improved therapeutic skills
T1 T2 T3 T4	B C B	Provided new ideas and methods for assessment and treatment. Improved confidence, knowledge and skills.
T3	A	Analysis of abnormal movements, suggested treatment techniques to them and guide the client to recovery.
T2	C	Difficult to be influenced by Bobath in a busy nhs environment
T2 T3	B B C	Update re: EBP Consideration of treatment positions & ideas / options. Improved handling
T3	B	assessment, generating working hypothesis, treatment approaches
T2	B	Allows me to apply research evidence into practice
T1 T3	A B	Background information. Handling skills. Better understanding of prognosis
T2	B	Evidence based practice to support strength training in stroke patients
T1 T4	A B	Recent course has made me consider strength training more. Also has given me a greater awareness of the importance of the link between core and hip stability and upper limb recovery.
T1 T2 T3	A A B B	Better understanding and application of skill learnt on course Encouraged me to keep updated on research, and using what is evidenced based in my

T4		practice Build my tool box to apply multiple approaches, and continuing use of what works best for each individual
T3 T4	B	Expanding my tool box of skills to use according to presentation of the client I work with. Using more of a motor control approach with more task specific treatments but using facilitatory handling where appropriate.
T2 T3	A B	Reminder of techniques, and update of relevant new information

Appendix v:

Themes related to attendance on non-neurological post graduate courses

Theme		Sub-theme	
Knowledge	T1	A	Increased knowledge from other physio areas –general observation
		B	Increased knowledge from other physio areas -MSK
		C	pain
		D	Core stability/balance
		E	Soft tissue mobilisation
		F	Vision
MDT working	T2	G	Orthotics/taping
Management skills	T3		
Communication/goal setting	T4		

T2	13	I completed a multi-disciplinary 'Life after stroke' course which altered the way I worked as part of a team and increased my appreciation of cross professional working
T1B	13	Training from MSK physiotherapists has assisted with theoretical and practical knowledge
T1A	13	Seeing others work, networking, exchanging ideas
T2 T1D	13	I don't attend a lot of non neuro courses,. I have recently attended a falls training session at my work place. It influenced my approach to establishing reasons behind falling and a multidisciplinary team approach. I am more aware of respiratory assessment from on-call training which sometimes influences my assessment approach in stroke physio in the community. For example I am more conscious of respiratory symptoms and can advise se appropriately.
T1A	13	As there are a limited number of neuro specific training opportunities it is useful to learn from other approaches as well
T1C	13	Provided possible (secondary) causes of upper limb pain eg shoulder impingement, arthritic changes etc..
T1A	13	Helps to keep your awareness of other physiotherapy methods
T1D T4	13	APPI modified Pilates for physiotherapists' course influenced my core stability work with neuro patients. Cognitive behavioural therapy day course improved my ability to challenge beliefs. A Mark Comerford kinetic control course- again good for core stability
T1D	13	Vestibular rehab courses have made me more aware of vestibular problems in the neurological population

T1A	13	As the area I work means that I treat high level stroke patients other courses have also been extremely relevant
T1B	13	Discussion with musculoskeletal shoulder specialists has assisted hugely
T1A	13	It is important to always remember that neurological patients may have other complications that are non-neurologically and to maintain these skills or refer on
T1A	13	A different questioning approach to my hands on techniques
T3	13	Undertook courses in CBT and Managing/leading people- influenced how I deal with people (patients NoK staff)
T4	13	Consideration of more self-management techniques
	13	A primitive reflex course aimed at treating non response to MSk has had some benefit with individuals with acquired and congenital neurological disorders
T1D	13	More inclusion of core stability and pilates based work
T1F	13	More knowledge About vision has been useful
T1A	13	Course on natural ageing process helped me to understand what is normal as people get older and what is more pathological
T4	13	Attendance on goal setting course was useful in talking to patients an about treatment goals, the future and Y training useful in engaging patients in treatment, motivation etc…
T3	13	Use of outcome measures
T2 T1D T1G	13	By involvement in and collaborating with bioengineer/orthotists colleagues I have broadened my knowledge/understanding of the effectiveness of AFO's in stroke rehab to improve dynamic balance and facilitate gait by addressing biomechanical problems associated with stroke
T1A	13	Choice of intervention/exercises use of other modalities (ie pain management)
T1E	13	Use of myofascial release techniques
T1C	13	attended Graded Motor Imagery course run by the Neuro-orthopaedic institute. This included a portion of Mirror visual feedback for pain management, This has improved outcomes for my patients with pain and also improved body schema for those with hemiplegia.
T1C T4		Chronic pain, neuropathic pain, cognitive behavioural approaches, CRPS management all have given me more knowledge and improved general management and understanding of pain in neuro clients.
T3		Provided real understanding of value for money in healthcare, how to optimise resources, how to manage staff etc.
T1D		I attended a modified Pilates course aimed at musculoskeletal problems but felt that working on core stability is also very pertinent to neuro patients so I have adapted the exercises for my patients.
T1A T1B T1E		Considered other therapy approaches musculoskeletal skills in handling and manual therapy has improved treatment skills with handling increased tone and contracture
T1B		The Manual Therapy is more often used now
T3		Management courses, incorporating people development, built skills in

		communication with different people has assisted with goal setting with patients.
T2		As I am in a MDT and often work in an interdisciplinary way therefore a Lot of courses I attend are not usually just physiotherapy related
T4		I haven't been to any non neuro external courses but have attended in service which has been no neuro specific. In particular an in service on goal setting has changed the way i communicate with patients and set goals. this has enabled me to improve client engagement in therapy and be more client centred in treatment planning
T3		A 'care aims' course has influenced decisions on whether or not to discharge patients.
T1E		Massage course, made more aware of fascial connections and how important they are in freedom of movement, particularly after a period of immobility or inactivity.
T1C T1E		work on fascia mobilisation with pain, if appropriate
T1B		Attending live shoulder surgery course and a day of MACP shoulder level study as part of a project I completed to do my post graduate diploma this year
T3 T4		Courses aimed at service delivery within limited resources have contributed to my knowledge of a more "business" minded approach. Also courses about psychological support for patients extends the role of "traditional" physio
T1A		Don't all courses have elements of the neurological system in the directly or indirectly and therefore have an influence on what you may or may not do for a particular problem
T1B		taking msk treatments into soft tissue problems and having a more holistic approach
T1A		Currently my workload is a mix of non-stroke and stroke and so I have had to increase my clinical skill base
T1B T1G		Kinesio taping supported me with more MSK problems of my neurological Patients.
T4		Cognitive behavioural skill, and building my ability to communicate and gain more compliance with therapy from my clients Reiki, CBT and NLP can be adapted to the individual to help regain confidence

Appendix vi:

Responses to perceived effect of stroke on upper limb motor control

Effect of stroke on motor control of the upper limb	**Median**	**IQ**	**Reported frequency of observation – number and (percentage) of respondents**					
			Alway	Usually	Often	Sometime	Never	No response
Pain	2	2-3	4 (2.8)	19 (13.3)	48 (33.6)	48 (33.6)	2 (1.4)	22 (15.4)
Reduced muscle activity/tone	3	3-4	12 (8.4)	56 (39.2)	40 (28)	13 (9.1)	0	22 (15.4)
Increased muscle activity/tone	3	2-3	4 (2.8)	26 (18.9)	55 (38.5)	35 (24.5)	0	23 (16.1)
Movement with altered pattern	4	3-4	25 (17.5)	53 (37.1)	35 (24.5)	8 (5.6)	0	22 (15.4)
Movement with altered range	3	2-4	21 (14.7)	44 (30.8)	41 (28.7)	15 (10.5)	0	22 (15.4)
Reduced coordination	3	2-4	8 (5.6)	30 (20.1)	54 (37.8)	29 (20.3)	0	22 (15.4)
Reduced proprioception	3	2-3	3 (2.1)	22 (15.4)	56 (39.2)	40 (28)	0	22 (15.4)
Reduced grip	3	3-4	6 (4.2)	52 (36.4)	50 (35)	13 (9.1)	0	23 (16.1)
Reduced sensation	3	2-3	3 (2.1)	19 (13.3)	59 (41.3)	28 (19.6)	1 (0.7)	23 (16.1)
Altered sensation	3	2-3	4 (2.8)	19 (13.3)	64 (44.8)	33 (23.1)	1 (0.7)	22 (15.4)
Neglect	2	2-3	1 (0.7)	5 (3.5)	48 (33.6)	66 (46.2)	1 (0.7)	22 (15.4)
Shoulder subluxation	2	2-3	0	13 (9.1)	46 (32.2)	61 (42.7)	1 (0.7)	22 (15.4)
Mal-alignment of other upper limb joint	2	2-3	1 (0.7)	19 (13.3)	32 (22.4)	61 (42.7)	8 (5.6)	22 (15.4)
The median and interquartile values were assessed using a 5 point Likert scale where 1= never, 2= sometimes, 3= often, 4=usually, 5 always								

Appendix vii:

Responses to frequency of use of treatment modalities

Modality	**Median**	**IQ**	**Frequency of use number and percentage of respondents**					
			Alway	Usually	Often	Sometime	Never	No response
Facilitatory handling	3	2-4	35 (24.5)	36 (25.2)	33 (23.1)	15 (10.5)	2 (1.4)	22 (15.4)
Inflatable splints	1	1-2	1 (0.7)	1 (0.7)	3 (4.9)	35 (24.5)	76 (53.1)	23 (16.1)
Motor re-learning	3	2-4	13 (9.1)	28 (19.6)	47 (32.9)	27 (18.9)	6 (4.2)	22 (15.4)
Postural training	3	2-4	13 (9.1)	34 (23.8)	33 (23.1)	37 (25.9)	4 (2.8)	22 (15.4)
Proprioceptive neuromuscular facilitation	2	1-2	2 (1.4)	8 (5.6)	13 (9.1)	69 (48.3)	29 (20.3)	22 (15.4)
Massage	2	1-3	2 (1.4)	10 (6.7)	25 (17.5)	59 (41.3)	123 (6.1)	24 (16.8)
Muscle stretching	3	2-4	9 (6.3)	29 (20.1)	38 (26.2)	42 (29.4)	2 (1.4)	23 (16.1)
Joint mobilisation	3	2-3	7 (4.5)	22 (15.4)	45 (31.5)	42 (29.4)	5 (3.5)	22 (15.4)
Strengthening	4	2-4	26 (18.2)	48 (33.6)	29 (20.3)	15 (10.5)	2 (1.4)	23 (16.1)
Strapping/taping	2	1-2	0 (0)	4 (2.8)	16 (11.2)	66 (46.2)	35 (24.5)	22 (15.4)
Sensory stimulation	3	2-4	20 (14.0)	28 (19.6)	43 (30.1)	25 (17.5)	3 (2.1)	24 (16.8)
Functional activity	4	3-5	55 (38.5)	45 (31.5)	17 (11.9)	3 (2.1)	1 (0.7)	22 (15.4)
Constraint therapy	2	1-2	0 (0)	3 (2.1)	4 (2.8)	77 (53.8)	36 (25.2)	23 (16.1)
Functional Electrical stimulation	2	1-2	1 (0.7)	4 (2.8)	17 (11.9)	53 (37.1)	46 (32.2)	22 (15.4)
Gym (Swiss) ball	2	1-2	0 (0)	5 (3.5)	30 (21)	70 (49)	15 (10.5)	23 (16.1)
Hydrotherapy	1	1-2	(0)	1 (0.7)	6 (4.2)	31 (21.7)	79 (55.2)	26 (18.2)

The median and interquartile values were assessed using a 5 point Likert scale where 1= never, 2= sometimes, 3= often, 4=usually, 5 always

Appendix viii:

Interview schedule phase 2

Phase 2 interview questions

Semi-structured format. These are subjects which should be covered

1. Background influences

Confirm/discuss working practice: type of unit working in (acute, rehabilitation, community) specificity of client load (stroke or varied neurology), number of stroke patients usually seen weekly (i.e. workload).
Discuss background knowledge about stroke: explore participants' reflection on philosophical background and potential influences on treatment choices and clinical practice (possible examples: what was included in degree course, post graduate training, current clinical practice, any other specific areas of practice which may have influenced treatment choices and clinical practice are there specific types of treatment which participants feel influence their practice. Research influence, papers read.
Do you feel that your approach to assessment and treatment of the arm after stroke is influenced by one particular concept of practice or is it based on a number of different influences and if so what/ which ones?

Examples of questions:
How has your work experience influenced your practice?
Are there papers that you have read or courses that you have attended influenced your practice?
Ask participants to "expand" on comments that they make.

2. Approach to assessment of the arm.

How is this approached by that participant and what sort of findings do they consider the most influential on any decision that they will then make about selecting a treatment to address the problem.
Do participants have a structured approach or is it more functional
What sorts of areas might be explored by the therapist during the examination and why?
What type of information does their assessment provide?
Are there differences in the information derived which relate to the way that the examination /assessment is carried out?

Examples of questions:
Would you talk me through the process that you use when you examine/assess the arm?
Tell me about the way that you examine the arm, what do you look at in your examination?
Why do you look at the things that you include in your assessment?
Can you tell me about a patient who has had a stroke that you have recently worked with, how you examined his /her arm after stroke?
Do you feel that you would assess the arm in the same way if it were early stroke compared with late stroke?
Are there particular things that you like to look at which are specific to the arm or the hand?

To what extent do you include assessment of the trunk in assessment of the arm?
What sort of findings would you feel were encouraging in relation to predicting the level of potential recovery of the arm?

3. Approach to treatment of the arm

What would therapists consider to be important symptoms related to their decisions about treatment (examples: background muscle tone trunk and upper limb, base of support, posture of the trunk, tone, position of the scapula, muscle strength, muscle length, alignment of glenohumeral position, function – or potential for function)

Examples of how questions may be phrased:
What do you feel is the most important information that your examination tells you about the problems that the patient may have with movement of their arm after stroke?
Once you have completed your assessment how do you move onto your treatment programme
What helps you to make decisions about the way that you will treat the client's arm after you have examined it
Would you describe to me /talk me through assessment and treatment decisions that you made with a recent patient who had a stroke

4. Collaboration with patients/carers/family members

How collaborative are the decisions which the therapist makes about the sort of problems experienced by patients after stroke i.e. do the therapists believe that they are asking the patient (family and carers) about what they want to do and achieve (who is involved in goal setting).

Examples of questions:
Do you find it useful to talk to the patients about their symptoms and the treatment as you go along?
Does feedback from the patient help you during the assessment and treatment process?
Tell me about a recent patient and the way that talking to them influenced (affected) your treatment.

5. Links between assessment, problem list and treatment

Exploration of the pathway/route of thinking that the therapist employs after assessment in making sense of the presentation and deciding on a treatment

Examples of questions:
How do you personally decide what you are going to work on after you have examined the patient?
After you have examined the patient do you usually know what you want to work on first?
Do you write a problem list?

After you have examined the patient how do you decide what your main priority is for treatment?
What sort of information collected during your examination/assessment helps you the most to know what you may work on first?
What sort of information do you feel helps you to identify (establish/work out) where you would like to start your treatment?

6. Decision making model (Pattern recognition/ hypothetico-deductive reasoning)

What is the type of reasoning process employed by the therapist in making decisions about assessment and treatment?

Examples of questions:
At the end of your examination do you usually feel that you understand the reason why the patient is having the problems that you have identified or do you have to stop and work it out.
Would you talk me through the way that you use your assessment to work out what sort of areas you want to start treatment in
Are there movement problems that you feel that you often see, can you give me some examples

7. Selection of treatment

What are the "cues" used by the therapist
What are the most influential factors used in designing and implementing a treatment

Examples of questions:
Would you tell me about a patient you have treated recently and give examples of why you would choose a particular sort of treatment?
After you have examined the patient how do you decide what sort of treatment you want to give?
Do you use particular treatments for particular problem (e.g. high or low tone, treatment specific to the hand?)
Would you talk to me about the sort of treatment modalities you used with a patient that you have treated recently?

8. How much does the treatment change between intention and delivery and what influences/drives this?

What does the therapist feel influences the delivery of the treatment that they have selected?

Examples of questions may be phrased:
Do you feel that you often have to alter or adapt your treatment as you go along?
What sort of observations would influence that decision?
Would you give me an example from working with a patient who you have treated recently?

Appendix ix:

Participant information phase 2 Information sheet consent form

Gillian Bamborough

Senior Lecturer in Physiotherapy

Northumbria University

Coach Lane Campus

Benton

Newcastle upon Tyne

NE7 7XA

Dear Northern ACPIN member,

My name is Gillian Bamborough. As part of the requirements of my Professional Doctorate in Physiotherapy in the School of Health, Community and Education at Northumbria University I am conducting a research study. I would like to explore the clinical decisions made by physiotherapists during treatment of a client's hemiplegic arm following a stroke, and I would like to invite you to participate in this study. The study will be in three phases of which this is the second.

Before you decide if you would like to participate we would like you to understand why the research is being done and what it would involve for you.

Part 1 of the enclosed information sheet tells you about the purpose of this study and what would be involved if you take part. Part 2 gives you more detailed information about the conduct of this study.

If you have any questions or concerns, or would like further information, please do not hesitate to contact me at: Gillian.Bamborough@northumbria.ac.uk: 0191 2156328 or my university supervisor Professor Nicola Adams, Professor in Allied Health, Northumbria University (Nicola.Adams@northumbria.ac.uk: 0191 2156620).

Thank you for considering taking part.

Gillian Bamborough

Information Sheet for Physiotherapists (Phase 2)

Research Study Title:
Interaction between the physiotherapist and client following hemiplegic stroke.

This study has been reviewed and approved by the City Road and Hampstead Research Ethics Committee.
REC Number: 12/LO/0819
Phase 2:
An exploration of the rationale underpinning selection of physiotherapy intervention for rehabilitation of specific presentations of the hemiplegic upper limb following stroke.

Part 1.

What is the study about?

This study aims to:

- Explore the rationale supporting selection of specific physiotherapy interventions for rehabilitation of the hemiplegic arm following stroke
- Explore the interaction between therapist and client during the delivery of an intervention for rehabilitation of the hemiplegic arm following stroke and if this influences the clinical decisions made by the therapist during the intervention.

This is the second phase of the study and is an exploration of the rationale underpinning physiotherapists' selection of physiotherapy interventions for rehabilitation of specific presentations of upper limb movement pathology following stroke.

Why is it being done?

Government policy and professional guidelines require physiotherapists to deliver interventions which are: evidence based, functionally relevant and client centred. Existing research suggests that clinical decisions during physiotherapy for rehabilitation of the hemiplegic arm after stroke require consideration of: the rationale supporting the choice of intervention, specific components of physiotherapy practice and how the intervention is delivered. However, information detailing the relationships between these factors is sparse and existing work identifies the need for further investigation; this study aims to identify and explore some of these relationships.

Why have I been asked?

You have been asked to consider participating in this research because it requires the involvement of a number of experienced Physiotherapists currently working in neurological rehabilitation.

What am I being asked to do?

If you decide to participate, you will be asked to read a number of vignettes detailing possible presentation of a client's hemiplegic arm following stroke and to complete a questionnaire about the treatments which you would consider as part of rehabilitation. The questionnaire should take no more than 30 minutes to complete and can be returned in the enclosed envelope or by email. A small number of respondents (selected randomly) will be invited to participate in a short (telephone) interview/discussion based on the general response to the questionnaires. This will be arranged at a time that is convenient for you. Each discussion will last for no more than 45 minutes and you will be asked to give consent for it to be audio-recorded. The discussion will be transcribed and you will have the option of reviewing the transcript of your discussion in order to verify, amend or comment further on the content to ensure your meaning is fully represented. There is a section

on the questionnaire where you can indicate if you would be prepared to participate in such an interview/discussion; if you would prefer to simply complete the questionnaire but not to participate in an interview/discussion please feel free to omit that section of the questionnaire.

What happens if I do not want to participate?

The choice to participate is completely voluntary and entirely up to you. If you do not wish to complete the enclosed questionnaire please ignore this letter: you will not be contacted further. If you would be prepared to complete and return the questionnaire but not to participate in the individual discussion please feel free to omit that section of the questionnaire. If you do decide to take part in the individual discussion, you will be contacted again and asked to sign a consent form; however you are still free to withdraw from the study at any time and without giving a reason.

What are the possible benefits of taking part?

Although you won't benefit directly from participating in this study, we hope that the information provided will benefit clients who have experienced stroke affecting movement of their arm.

Will the information I provide be kept anonymous?

Yes. The proposal for this study has been approved and passed by the Ethics Committee for Northumbria University School of Health Community and Education. We will follow ethical and legal practice and all information about you will be handled in confidence. Confidentiality, anonymity, and privacy will be ensured throughout the collection, storage, final report writing and publication of research material relating to this study.

This completes part 1. If the information in part 1 has interested you and you are considering participation, please read the additional information in part 2 before making any decision.

Part 2.

What will happen to the data that is gathered?

The questionnaires and transcripts of the individual discussions/ interview will be allocated numerical identification and the answers will not be attributable to any respondent; this anonymity will be maintained throughout the process including during the final report writing. All information, including the original tapes of the discussion will be stored within a locked cabinet and data derived from the questionnaires and interviews will be kept in password-protected files. All data will be kept in these secure conditions until completion of the project, after which they will be destroyed in accordance with Northumbria University policies for handling confidential material.

What will happen to the results of the research study - how will the research report be disseminated?

The outcomes of the research will generate part of the basis of the dissertation for my professional doctorate award. It is anticipated that the finding of the research will be disseminated in peer reviewed journals and at relevant conferences.

What next?

If you would be willing to participate in this study, the next stage is to read the vignettes and to complete and return the attached questionnaire in the envelope provided or by email.

Who do I contact if I have any questions?

If you have any questions or concerns, or would like further information, please do not hesitate to contact me at: Gillian.Bamborough@northumbria.ac.uk: 0191 2156328 or my university supervisor Professor Nicola Adams, Professor in Allied Health, Northumbria University (Nicola.Adams@northumbria.ac.uk: 0191 2156620).

Please feel free to retain this information sheet
Thank you for considering taking part.

If you would like to participate, please open the attached survey packet and begin completing the questionnaire. When you have finished please use the enclosed envelope or email to return the questionnaire.

Gillian Bamborough

Appendix x:

Examples of participant's letter regarding amendments phase 2

From:
Sent: 15 February 2013 20:13
To: Gillian Bamborough
Subject: Re: transcription of upper limb discussion

Hello Gill
I hope that you are well. Please find attached my annotated transcript. I have used 'track changes' so all changes should be in red and highlighted by a line in the left margin. I have made a few small changes but generally I am very happy that this covers our conversation as I remember it and it accurately represents what we were discussing. I haven't added much as I think it is all covered.
It is strange reading your own words typed up - I make no sense at all and very rudely keep interupting you - sorry!
Let me know if you require any further clarification and I hope it is all going well for you.
Take care

----- Original Message -----
From: Gillian Bamborough
To:
Sent: Thursday, February 14, 2013 7:44 PM
Subject: transcription of upper limb discussion

Hello again
I am so sorry to have taken this long to get back to you with the transcript …a combination of my being ill (again!!! I can't believe it …!), a bit of a sudden rush of university and hospital work …and being a very slow typist!!!

Anyway … finally….at last ….. this is the typed version of our conversation ..(would you let me know if you would prefer me to send you out a paper version?) I appreciate that it is a while since we spoke and it is unlikely that you will remember exactly what was said but would you mind reading through and confirming that :

- you feel that this covers our conversation to the best of your knowledge
- that you are happy that your comments/responses are recorded in such a way as to accurately represent what you think about the areas being discussed.

I very much appreciate the time and effort that you have taken to do this for me and am very concerned that the final version is one that you are happy with -would you feel quite free to amend (or remove) any areas that you are not happy about and to add in any further comments which you feel either expand on your thoughts or give greater clarity …would you mind doing this in a different colour just so that it is easier for me to track and also for me to be certain that your thoughts and opinions have been accurately recorded.

Very best wishes and many thanks

Gill
Lecturer Practitioner in Physiotherapy
Faculty of Health and Life Sciences
Room E104
Coach Lane Campus
Northumbria University
Coach Lane
Benton
Newcastle upon Tyne
NE7 7XA

Appendix xi:

Examples of phase 2 data analysis

Example of coding table

Line	Comment	Theme	Sub theme	Codes
14	Okay, yeah. So, sort of, imagining is someone is... Has just come into our unit and setting them up and thinking of what we're going to do with their arm.	Respondent clarification	Reflection on assessment of an imaginary patient	
20	So the range of movement.	Assessment content	Joint range	3.6
21	Arms, legs, strength, toes.		Muscle strength	3.7
22	Anything that's limiting joints or length of muscle or positioning.		Limiting factors Joint alignment/posture Muscle length	3.6 6.3
24	And obviously we look at, you know, mobility.	General assessment Link between wider motor control and upper limb function/movement	Mobility	6.4
30	Yes, I suppose, I would... Regarding upper limb, in the back of my mind, there would be shoulder stability,	Assessment content	Shoulder stability	3.5a
31	some shoulder pain issues. That would... That would be quite a priority, if they weren't already managed.	Assessment content Prioritisation of symptoms	Prioritisation of symptoms Pain	3.3a
32	Just, sort of, looking at if any further damage can be caused to the shoulder,	Assessment content	Protection of existing joint integrity	8.1
33	or if they need some medication input,	Management of pain Linking with other MDT members	Medical input	4.2 5.5
35	Or is it more long-term? That kind of thing.	Prediction of severity of problem		5.5
36	I'd look at... At tone, quite specifically.	Content of assessment	Muscle activity – postural tone	3.4
37	And how it was affecting function	Holistic content	Relationship between impairment and function	5.3
56	And you can also... When we... Because of the way that we run our unit, we have rehab support workers who... Who are more than just carers.	Working environment	Programmes designed by physio but implemented by rehab worker	4.1c

58	So I always... I'm always thinking about what types of things I can put in place for the support worker to be doing with the person.	Working environment	Non-qualified staff	4.1c
59	And if that is things like handling of the limb, and making sure they wear their support or upper limb stretching exercises.	Working and care environment	Limb handling Support provision and fitting exercises	4.1c 4.6
60	We've got, sort of, standard things like the graph-type exercises and...	Standardisation of programmes		4.6
68	I would be looking at resting splints and thing in conjunction with OTs.	Therapist thinking about provision beyond immediate hands on Making patients environment conducive to movement recovery or maintenance	Resting splints MDT working	4.6
80	We tend to get more severe types of strokes in the unit and... You know, the... You know, the clot they went in and they tried to get the clot and they ruptured (the)artery .	Client group treated	Severity of presentation	1.3 1.5a 2.5
83	I also think that we're quite... Well, I like to think that I aim towards self management	Severity of stroke Potential for functional change Requirement for long term care	Self-management	1.3 1.5a 2.5
90	Teaching carers and family and teaching the, you know, the patient to do their own exercises.	Therapists belief in self-management		5.8
91	and kind of, you know, be aware that this is going to be like this for... Maybe forever.	Long term planning Realistic goals Patient and family awareness and honesty about long term expectations		2.5 4.3b 5.8 8.8
111	Yeah, yeah. I suppose, obviously, tonal issues.	Rationale	Muscle tone (high or low)	3.4
114	I would start off in my mind of, you know, Botox injections and all that type of thing.	MDT medical intervention		4.2
116	But if my... If I have someone admitted and they're quite early, post-stroke,	Rationale	Time since onset of stroke	1.5a 1.5b
117	and then they have some sort of extension at the wrist or fingers, I usually think that's a good sign.	Rationale	Selective hand movement	3.10

118	I tend to manage them differently to someone who had inattention, sensory loss, and very low tone or very high tone.	Rationale	Inattention Sensory loss Altered tone	5.1 5.6
143	If you're... Yes, I think if you're looking at someone that's in bed you're going to get a different... Maybe a different opinion to if you're in... Sitting. And especially walking a room.	Position in which patient is during assessment can relate to movement	Normal movement patterns Static Vs dynamic assessment	6.1a
146	But I suppose if you're testing range of motion at the shoulder, there's a lot that goes in with trunk positioning	Kinetic chains Normal movements	Trunk/shoulder	3.5a 3.5b 6.2
174	Yeah, yeah. And when I work with OTs, like, we do a lot of kitchen work together and say get someone in to standing... To do some kitchen work and use the arm reach beyond the affected arm.	Rationale		4.2 5.4 5.5
194	And also to include a lot more MSK-type work. Joint mobilisations	treating problems which are in non-neural structures Soft tissue shortening etc….	MSK approach –	6.3 4.6
209	That they're not going to be pulling on other areas. But that will help them to maintain, almost, the integrity of the structures as much as possible.	Therapists responsibility for quality of movement		1.3 6.2 5.8
211	And it's... I think it's... We need to develop that more. Like, I've started doing a lot more home exercise programmes.	Therapist perception that need to give patient awareness of how to cope long term Patient responsibility	Home ex programmes	1.3 4.6 6.2 5.8
219	Yeah, I don't want to make them feel like they have to do this thing for someone every day or... You know, thinking about it too much when they should just be thinking about, kind of, how much to support them. Like emotionally or...		Need to support family	5.8 8.6 8.8

Phase 2: Example of a single code

Line	Comment	Overview	Specific	Code
33	or if they need some medication input,	Management of pain Linking with other MDT members	Medical input	4.2
34	do I need to provide them with a sling?	Management of symptoms	Orthotics - sling	4.6
39	So I would be thinking Botox.	Management of symptoms MDT working	Medication to manage muscle tone	4.2
41	And get our consultant to have a look at them regarding Botox.	MDT working	Medication to manage muscle tone	4.2
43	so... We've also got... You know, the saeboflex flex. …. kind of, kit that we use quite a lot.	Example of specific intervention Jump from assessment to treatment Possible indicator of pattern recognition	Saeboflex	4.6
46	Although they've got something... They have their own, kind of, FES-type unit for gait and things like that.	Specific intervention FES		4.6
47	But it's... It's like a dynamic splint. It overlaps, very much, OT and physio.	MDT working/splinting Holistic approach Specific intervention	Dynamic splinting	4.2 4.6
50	So you provide them with it, and if they...	Patient is " provided" with an external intervention	Treatment derived from post grad course	4.8
52	And it's basically to do with repetition and task-orientated... Function of the upper limb.	Type of intervention Discussion of Rationale	Repetition Task orientation function	4.6
55	such as electrical stimulation. You know, muscle stimulators and things like that.	Description of options		4.6
56	And you can also... When we... Because of the way that we run our unit, we have rehab support workers who... Who are more than just carers.	Working environment	Programmes designed by physio but implemented by rehab worker	4.1c
57	So they carry out the treatment programmes that we put in place.	Working environment	Non-qualified staff	4.1c
58	So I always... I'm always thinking about what types of things I can put in place for the support worker to be doing with the person.	Working environment	Non-qualified staff	4.1c

59	And if that is things like handling of the limb, and making sure they wear their support or upper limb stretching exercises.	Working and care environment	Limb handling Support provision and fitting exercises	4.1c 4.6
60	We've got, sort of, standard things like the grasp-type exercises and...	Standardisation of programmes		4.6
61	All sorts of general activities	Content of programmes	General activity	4.6
62	A range of motion type things		Range of motion	4.6
67	And as well as the saebo flexes that are appropriate... Which is like a functional splint and dynamic_splint__	Therapist thinking about provision beyond immediate hands on Making patients environment conducive to movement recovery or maintenance	Dynamic splinting	4.6
68	I would be looking at resting splints and thing in conjunction with OTs.	Therapist thinking about provision beyond immediate hands on Making patients environment conducive to movement recovery or maintenance	Resting splints	4.6
103	Yeah. Yeah, we get... We get really good results,			
104	but it's because we have such a, I think, like a team approach and enough time.	MDT working		4.1b 4.2
114	I would start off in my mind of, you know, Botox injections and all that type of thing.	MDT medical intervention		4.2
115	And then I would look at... Usually. I don't know if this is actually in the evidence anywhere.			4.4
148	and trying to get full weight at the shoulder. You can cause some damage ___.			4.6
157	Probably... I mean, there's a lot of Bobath___ stuff. I wasn't taught that specifically in Uni. Do you mean, like, in training?			4.7
161	I mean, quite a lot of the Bobath type stuff –the way that they run their sessions, I don't... I tend to use only small elements of that and have it more... With the sort of, task-orientated...	Therapist expresses lack of confidence using Bobath concept approach	Bobath concept approach	4.7

162	I know Bobath are going more towards that anyway. But... Yeah, I tend to not use so much of the kind of... Different ___.	Understanding of treatment approach	Bobath concept approach	4.7
163	But I do... I do use all the things that they... You know, the weight bearing through the limb and The reaching and...	Understanding of treatment approach	Use of " Bobath" techniques	4.6
174	Yeah, yeah. And when I work with OTs, like, we do a lot of kitchen work together and say get someone in to standing... To do some kitchen work and use the arm reach beyond the affected arm.	Rationale		4.2
197	but we do so much MSK and, you know, exercise programmes all the time.	Rx example	Joint mobilisations	4.6
203	Well, we demonstrate it in our, sort of, hand therapy training.	Teaching other staff members Treatment by other staff members	Including hand joints	4.1 4.2
211	And it's... I think it's... We need to develop that more. Like, I've started doing a lot more home exercise programmes.	Therapist perception that need to give patient awareness of how to cope long term Patient responsibility	Home ex programmes	4.6
250	And also the tone would need... I would have to manage it with botox.	Rationale	Treatment of increased tone	4.2
253	We've had a lot of people who... We do a lot of vocational rehab, for the OTs. We do a lot of workplace stuff and things like that	Rationale	MDT working Role of OT	4.2
286	There's just... There's only one other thing that I might have said in management terms, that I've started thinking about more recently – because I'm using it a bit more. And that's the... I don't have much to do with it. The, kind of, sensory stuff.	Rationale	Importance of treatment of sensation	4.6

Example of a single Theme

Phase 2 Theme 4: influences on treatment (colours represent dates of additions following analysis of further transcripts)					
Sub-theme	(date) 26.06.14	29.07.14	01.08.14	06.08.14	**Final theme and subtheme 01.06.15**
1	Structure of service	Structure of service	Structure of service	Structure of service	**Theme 2 a structure of service**
		1a community	1a community	1a community	**Theme 2a**
		1b time limitations	1b time limitations	1b time limitations (also increased availability of time for treatment)	**Theme 2a**
		1c staff availability	1c staff availability	1c staff availability	**Theme 2a**
2	MDT working	MDT working	MDT working	MDT working	**Theme 2a**
3	Goal setting	Goal setting	Goal setting	Goal setting	**Theme 5 b Client and therapists working together**
		3a relevant to patient	3a relevant to patient	3a relevant to patient	**Theme 5 b**
			3b discussed with patient and achievable	3b discussed with patient and achievable or being honest about possible level of recovery	**Theme 4b Client's emotions**
4	EBP/research/	EBP/research/RCP stroke guidelines	EBP/research/RCP stroke guidelines	EBP/research/RCP stroke guidelines	**Theme 2b Evidence based practice**
5	Patient engagement	Patient engagement	Patient engagement and awareness	Patient engagement and awareness	**Theme 4a client and their body**
6	Specific examples of treatment	Specific examples of treatment	Specific examples of treatment	Specific examples of treatment	**Theme 2c Therapists background knowledge**
				6a patient specific treatment	**Theme 2c**
7	Bobath	Bobath	Bobath	Bobath	**Theme 2c**

8			Courses (including university)	Courses (including university)	**Theme 2b**
9	Outcome measures	Outcome measures (formal and patient specific /guided by patient goal)	Outcome measures (formal and patient specific /guided by patient goal)	Outcome measures (formal and patient specific /guided by patient goal)	**Theme 2b**

Appendix xii:

Assessment components phase 2

Content of assessment discussed by physiotherapists (Phase 2)

X indicates area identified but no contextual comments

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10
Active movement	selective	X		X	Natural movement Active ranges	Initiation Kinetics Coordination Speed Accuracy	Background activity Coordination	X	Range coordination	
Balance	X	Sitting Standing	Sitting and standing independent dynamic	Sitting		X				X
Cognition	X			X	Focus of patient Motivation	Focus of patient Motivation		Cognition Ability to self-manage	Perceptual problems Suitability for constraint therapy	Awareness of limbs Awareness of self
Effort of movement	Tone changes		Associated reactions		Associated reactions		Fatigue	Associated reactions		
Engagement with environment					Emotions Interaction with	X	X		X	Emotions Interaction with environment

					environment					
Facilitated/guided movement	X		Response to handling	Following of guided movement		Response to handling			Response to handling	Response to sensory cueing and handling
Finger movement	X					X		X	X	X
Function	Washing Dressing Grooming	Using utensils		X	Washing dressing	Patient selected		Independent/ Kitchen with OT	X	X
Joint alignment	General Shoulder			Shoulder		Resting alignment of arm		Shoulder		
Joint range	X	X	X	X	X stiffness					
Grip	X	Grasp release		Grasp release		Grasp release	Grip strength		X	
Glenohumeral Subluxation				X	Shoulder position				Alignment of head of humerus botox	
Hand placing	X				X	X		X	X	
Hand shaping	X			X	X	Adaptation of hand to object		X	X	X
inattention		X			X engagement with body		neglect	X	Engagement with body	
Interaction of different body parts	Thorax-Scapula-Arm			Thorax-Scapula-Arm	Thorax-Scapula-Arm	Thorax-Scapula-Arm	Midline		Thorax/scapula Midline	Interaction with gravity Spatial orientation
Language				X			Communication			
Limitations			Shortening of soft tissue	Soft tissue length and stiffness	Shortening of soft tissue			Joint range Body Position	Joint range	

					Blocks to movement					
Mobility				X	X			Gait		walking
Muscle tone	Heaviness of arm	X	Arm feels heavy Arm feels tight	X	Flexor patterning	Patients feeling of limb heaviness		X	X	Weight of arm
Pain				X	X			Damage Botox/steroid External Support		X
Patterns of movement	Quality Compensation	X	Compensation	X	X	Pattern of movement Assess if compensation useful or detrimental to function				
Passive movement	X			X					X	
Postural control/stability	X	Sitting	Relationship with base of support	Postural stability	Posture Thorax alignment	X	Interaction with base of support	Trunk positioning/midline	Trunk position Midline	Posture and trunk alignment
Reaching	X	X	Placement	X				X		
Scapula movement				X						
Scapula/thorax/pelvis interaction	X	X	Trunk position					Upper limb/trunk	Scapula trunk	
Sensation	Touch Temp Texture	X		Touch Proprioception		Related to ability to move	Touch Proprioception	Touch	Firm touch Light touch Hot/cold	X
Splinting	saeboflex							saeboflex	X	
Strength	X	X	X	X			X	X	X	

Vision						As part of function				As part of function/awareness

Appendix xiii:

Interview schedule phase 3

Phase 3 interview questions

Semi-structured format; based on viewing videotape of treatment session.
These are subjects which should be covered but should allow for reflection

The interview format will be based on viewing of the supporting video recording: questions will be related to exploring the following areas in relation to specific interventions.

Supporting studies

Noll, key and Jensen (2001); Wain *et al*., (2008); McGlinchey and Davenport (2014).

Physiotherapists interview guide

Selection of intervention

- Objective: What were you doing (relates to hand and body position; as much specificity as possible)
- Why were you doing that (indications, rationale, relates to hand and body position; as much specificity as possible)
- Related to previous action (if so how)
- Related to next action (if so how)

Delivery of intervention

- Was there a difference between the intended delivery and the actual delivery?
- What were those changes based on (what influenced decisions between intention and actuality)?
- What could you see (were there any changes as a result of the intervention?)
- What could you feel (were there any changes as a result of the intervention?)

Intention

- What was the wider objective (assessing, screening, treating)?
- What was the Specific objective?
- What were the indications (rationale)?
- Why should this intervention address the problems identified (Understanding)?
- Limitations (anticipated or unexpected)
- Objective achieved/not achieved; reflection)

Interaction with client

- Formal/informal
- Intentional (providing information or seeking feedback, reassurance therapist/client)
- Initiated by therapist or client

Wider issues which may be explored during the interview

Therapists Background

- Are any specific factors mentioned which relate to theoretical or paradigmic background (undergraduate training, other physiotherapy rotations, postgraduate courses)

Overarching objective of the treatment session?

- Links to goal setting (MDT/global and/or specific to the session)
- Planning of session in advance (how much /how little/ rationale)
- Areas which you had intended to include in the treatment session
- Why did you intend to include these areas?
- Were these included?
- If so why
- If not, why not
- Supporting evidence for inclusion/non-inclusion of interventions employed

Client interview guide.

- General introduction to the interview putting client at ease (discussion, introduce myself, checking for fatigue or any discomfort, assure privacy and confidentiality).
- Reassure purpose of interview but reassure of informality and confidentially (especially in relation to the therapist).
- General thoughts about how they felt about the session (time spent, comfort during session, objectives of session, links with their personal goals, interventions, level of inclusion, enjoyment, was session what they expected, is experience of physiotherapy as whole what they expected).
- For each area viewed discuss with client what they were experiencing (pain, stretch, discomfort, awareness of movement (positive /negative).
- What was client thinking (happy, sad, bored, included, focussed, aware of objective, tired).
- Explore interaction (degree of sharing of objectives and actions, did client feel that they were participating or was therapy being applied).

Appendix xiv:

Caldecott approval

Caldicott Approval Form - for use or release of service user identifiable data
(Please print clearly)

Title: Physiotherapy for upper limb rehabilitation after stroke
Description of proposal: An investigation of the content, rationale and interaction between the physiotherapist and the client during delivery of a clinical intervention for rehabilitation of the hemiplegic upper limb following stroke.
Indicate which data items have been requested: **Forename:** ☐ **Surname:** ☐ **DoB:** X **Age:** X **Sex:** ☐ **Address:** ☐ **Postcode:** ☐ **NHS No.** ☐ **Other** ☐ **(Please state)**
Name of organisation receiving data: Northumbria University
Person responsible for release of data: **Name: Gill Bamborough** **Job title: Physiotherapist** **Person responsible for receipt of data:** **Name: Gill Bamborough** **Job title: Physiotherapist** **For what time period is data transfer required** **Start date: 21.1.13** **End date: 31.7.13** **Please state regularity** eg monthly __**As necessary**

Contact details in relation to this form:

Name: Gill Bamborough

Address: Physiotherapy Dept, Sunderland Royal Hospital, Kayll Road, Sunderland, SR4 7TP

Telephone: 0191 215 6328

Email: gill.bamborough@chsft.nhs.uk

How will the data be transferred?

Paper records X

Computer record X

(Note – Patient/user identifiable data must only transferred by e-mail using the secure NHS network ie @nhs.net)

Who else will have access to the data?
(If data recipients are not employed by the NHS please state whether NHS honorary contracts are in place. If not – detail confidentiality agreements.)

Only those required for regulatory oversight, audit or inspection will have access to this data.

How will the service users be contacted?

Potential client participants will be screened initially by the physiotherapist who is treating them to ensure that clients are considered by the medical and rehabilitation team to be able to understand and retain information in order to provide informed consent. All clients who meet the inclusion criteria and are working with physiotherapists who have consented to take part in the study as part of their rehabilitation will be given information about the study and will be asked to indicate their interest to the therapist involved in their rehabilitation.

How will service users consent be obtained? If no consent being obtained, please detail the reason why not eg exemption under section 60 Health & Social Care Act 2001

Consent will be obtained following a personal conversation with the researcher in the presence of an independent person elected by the client if requested. This is to ensure that all questions have been addressed prior to requesting and obtaining consent.

Where will the data be stored?

Data will be stored an analysed on Trust and university computers.

How will data be protected? (Please detail security measures to be taken)

All personal information will be stored on password protected computers.

If the data is on a computer is there access via a network?

No

How long will the data be stored?

1 year

At the end of this period how will the data be disposed?

Electronic data will be deleted and paper records will be destroyed as per trust procedures.

Who will be responsible to ensure that the data is disposed of in a confidential manner?

Gill Bamborough

You must address the 6 Caldicott Principles – please give a brief description under each of the following headings

Principle 1 -**Justify the purpose(s)** Every proposed use or transfer of service user-identifiable information within or from an organisation should be clearly defined and scrutinised, with continuing uses regularly reviewed, by an appropriate guardian.

The only personally identifiable information that will be required is age and gender. This is important clinical information that will be necessary for the research question.

Principle 2 -**Don't use service user-identifiable information unless it is absolutely necessary.**
Service user-identifiable information items should not be included unless it is essential for the specified purpose(s) of that flow. The need for service users to be identified should be considered at each stage of satisfying the purpose(s).

No additional personal information that is unnecessary will be collected. Gender and age will be used in relation to specific physiotherapy techniques that are reliant on this information.

Principle 3 -**Use the minimum necessary service user-identifiable information.**
Where use of service user-identifiable information is considered to be essential, the inclusion of each individual item of information should be considered and justified so that the minimum amount of identifiable information is transferred or accessible as is necessary for a given function to be carried out.

The personal information collected will only be necessary for the purposes of the research study. This is the minimum data required in order to answer the research question. No ancillary information will be collected.

Principle 4 - Access to service user-identifiable information should be on a strictly need-to-know basis.
Only those individuals who need access to service user-identifiable information should have access to it, and they should only have access to the information items that they need to see. This may mean introducing access controls or splitting information flows where one information flow is used for several purposes.

No personal information will be provided to any other party. The research will be kept strictly confidential.

Principle 5 -**Everyone with access to service user-identifiable information should be aware of their responsibilities.**
Action should be taken to ensure that those handling service user-identifiable information - both clinical and non-clinical staff - are made fully aware of their responsibilities and obligations to respect service user confidentiality.

Only the investigator will have access to user identifiable data. The investigator is experienced in research and is familiar with the responsibilities of confidentiality.

Principle 6 -**Understand and comply with the law.**
Every use of service user-identifiable information must be lawful. Someone in each organisation handling service user information should be responsible for ensuring that the organisation complies with legal requirements.

The investigator will be responsible for the transfer of information so that it is consistent with the Data Protection Act and Caldicott Principles.

Other supporting information e.g. Ethics approval, correspondence etc

I confirm that the data will be held and used according to the conditions and information
given as described within this approval from.
Name: Gill Bamborough
Title: Physiotherapist
Signature: ……
Date: ……....

Please return form to:

For Office Use Only

The release and use of data as described above: **approved / not approved**

Caldicott

guardian/deputy:……Date:……

1. The data will be treated as confidential.
2. The data will be used only for the purposes described.
3. In the case of anonymised or confidential aggregated data, no attempt will be made to identify or contact individuals or organisations identified through these data.
4. The data may be disclosed to staff of the above organisation but only for the purposes described.

5. The data may not be disclosed to any third party.
6. The data will be stored in secure condition at all times whether held on computer medium or as a printed copy.
7. The organisation to which the data are released will maintain and comply with a Data Protection Registration which encompasses the data and data usage described.
8. The data will be destroyed when the work is completed: any printed copies will be destroyed, and files deleted from computer systems (including any copies held on backup or archive media).

9. All staff given access to the data will be made aware of these conditions (principle 5)

Appendix xv:

Participant information phase 3

Physiotherapists

Information Sheet for Physiotherapists (Phase 3)

Research Study Title:
Interaction between the physiotherapist and client following hemiplegic stroke.

This study has been reviewed and approved by the City Road and Hampstead Research Ethics Committee.
REC Number: 12/LO/0819
Phase 3:
An exploration of the interaction between therapist and client during delivery of physiotherapy intervention for rehabilitation of movement of the hemiplegic upper limb following stroke.

Part 1.

What is the study about?

This study aims to:

- Explore the rationale supporting selection of specific physiotherapy interventions for rehabilitation of the hemiplegic arm following stroke.
- Explore the interaction between therapist and client during the delivery of an intervention for rehabilitation of the hemiplegic arm following stroke and if this influences the clinical decisions made by the therapist during the intervention.

This is the third phase of the study and is an exploration of the rationale and influence of therapist/client interaction on physiotherapists' selection and delivery of physiotherapy interventions during rehabilitation of the hemiplegic arm following stroke.

Why is it being done?

Government policy and professional guidelines require physiotherapists to deliver interventions which are: evidence based, functionally relevant and client centred. Existing research suggests that clinical decisions during physiotherapy for rehabilitation of the hemiplegic arm after stroke require consideration of: the rationale supporting the choice of intervention, specific components of physiotherapy practice and how the intervention is delivered. However information detailing the relationships between these factors is

sparse and existing work identifies the need for further investigation; this study aims to identify and explore some of these relationships.

Why have I been asked?

You have been asked to consider participating in this research because it requires the involvement of a small number of experienced Physiotherapists currently working in neurological rehabilitation. The study has been granted ethical approval to recruit participants working or receiving physiotherapy from City Hospitals Foundation Trust Sunderland.

What am I being asked to do?

If you decide to participate, you will be asked to consent for video and audio recording to be made of a physiotherapy treatment session (for the arm) which you undertake as part of routine treatment with a client who you have previously assessed and treated as part of your clinical practice (the client will also have consented to participate). Following this you will be asked to participate in a short interview/discussion where you will be able to review the tapes and to discuss your interaction with the client and how this influenced the decisions you made about the content and delivery of the session. Each discussion will last for approximately 45 minutes; this will be audio-recorded. The discussion will be transcribed and you will have the option of reviewing the transcript of your discussion in order to verify, amend or comment further on the content to ensure your meaning is fully represented.

What happens if I do not want to participate?

The choice to participate is completely voluntary and entirely up to you. If you do decide to take part, you will be contacted again and asked to sign a consent form; however you are still free to withdraw from the study at any time and without giving a reason.

What are the possible benefits of taking part?

Although you won't benefit directly from participating in this study, we hope that the information provided will benefit clients who have experienced stroke affecting movement of their arm.

Will the information I provide be kept anonymous?

Yes. The proposal for this study has been approved and passed by the Ethics Committee for Northumbria University School of Health Community and Education. We will follow ethical and legal practice and all information about you will be handled in confidence. Confidentiality, anonymity, and privacy will be ensured throughout the collection, storage, final report writing and publication of research material relating to this study.

This completes part 1. If the information in part 1 has interested you and you are considering participation, please read the additional information in part 2 before making any decision.

Part 2.

What will happen to the data that is gathered?

The audio tapes, video tapes and transcripts of the individual discussions/ interview will be allocated numerical identification and the answers will not be attributable to any participant; this anonymity will be maintained throughout the process including during the final report writing. The tapes will only be viewed by you, the client (and their supporter if requested by the client) and the researcher. All information, including the video and audio tapes of the physiotherapy session and audio tapes of the discussion will be stored within a locked cabinet and data derived from the tapes and interviews will be kept in password-protected files. All data will be kept in these secure conditions until completion of the project, after which they will be destroyed in accordance with Northumbria University policies for handling confidential material.

What will happen to the results of the research study - how will the research report be disseminated?

The outcomes of the research will generate part of the basis of the dissertation for my professional doctorate award. I am happy for you to see this; if you would like a copy, please indicate this on the attached consent form. It is anticipated that the findings of the research will be disseminated in peer reviewed journals and at relevant conferences.

What next?

If you would be willing to participate in this study, the next stage is to complete the consent form and return this to the researcher in the envelope provided. If you have questions which you would like to ask before making decisions please see the section below for contact details.

Who do I contact if I have any questions?

If you have any questions or concerns, or would like further information, please do not hesitate to contact me at: Gillian.Bamborough@northumbria.ac.uk: 0191 2156328 or my university supervisor Professor Nicola Adams, Professor in Allied Health, Northumbria University (Nicola.Adams@northumbria.ac.uk: 0191 2156620).

Please feel free to retain this information sheet

Thank you for considering taking part.

Gillian Bamborough

INFORMED CONSENT FORM (physiotherapist)

Research Study Title:
Interaction between the physiotherapist and client following hemiplegic stroke.

This study has been reviewed and approved by the City Road and Hampstead Research Ethics Committee.
REC Number: 12/LO/0819
Name of principal Investigator: Gillian Bamborough, Senior lecturer in physiotherapy, Northumbria University.

Phase 3: An exploration of the interaction between therapist and client during delivery of physiotherapy intervention for rehabilitation of movement of the hemiplegic upper limb following stroke.

PLEASE INITIAL THE BOXES IF YOU AGREE WITH EACH SECTION.

1. I have read the physiotherapists' information sheet for phase 3 version V4 dated 25.05.12 and have been given a copy to keep. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected. ☐
3. I agree to the physiotherapy treatment I deliver being audio recorded/video recorded and I understand that the written analysis of the treatment will be anonymised. ☐
4. I agree to an audio recording being made of my post treatment interview and I understand that the written analysis of the interview will be anonymised. ☐
5. I know how to contact the research team if I need to. ☐

6. I agree to participate in this study. 

Participant name date signature

Name of Researcher taking consent date
signature

Original for Investigator Site File, 1 copy for participant.

Appendix xvi:

Participant information phase 3

Client Information

Gillian Bamborough

Senior Lecturer in Physiotherapy

School of Health Community and Education Studies

Coach Lane Campus

Northumbria University

Coach Lane

Benton

Newcastle upon Tyne

NE7 7XA

Dear service user,

My name is Gillian Bamborough. I am studying for a Professional Doctorate in Physiotherapy in the School of Health, Community and Education at Northumbria University and as part of this I am conducting a research study. I would like to explore how clients and physiotherapists work together during physiotherapy sessions to make decisions about treatment of the hemiplegic arm after stroke and I would like to invite you to participate in this study. The study is in three phases of which this is the third. Before you decide if you would like to participate we would like you to understand why the research is being done and what it would involve for you.

Part 1 of the enclosed information sheet tells you about the purpose of this study and what would be involved if you take part. Part 2 gives you more detailed information about the conduct of this study.

If you have any questions or concerns, or would like further information about this research project, please do not hesitate to contact me at: Gillian.Bamborough@northumbria.ac.uk: 0191 2156328 or my university supervisor Professor Nicola Adams, Professor in Allied Health, Northumbria University Nicola.Adams@northumbria.ac.uk: 0191 2156620

Thank you for considering taking part.

Gillian Bamborough

Information Sheet for Clients (Phase 3)

Research Study Title:
Interaction between the physiotherapist and client following hemiplegic stroke.

This study has been reviewed and approved by the City Road and Hampstead Research Ethics Committee.
REC Number: 12/LO/0819
Phase 3:
An exploration of the interaction between therapist and client during delivery of physiotherapy intervention for rehabilitation of movement of the hemiplegic upper limb following stroke.

Part 1.

What is the study about?

This study aims to:

- Explore the reasons why specific types of physiotherapy are chosen during treatment of the hemiplegic arm following stroke.
- Explore how the way that the therapist and client work with one another during physiotherapy of the hemiplegic arm following stroke influences the decisions made by the therapist about the treatment.

The study is in three parts, this is the third part and is an exploration of how service users and physiotherapists work together during a physiotherapy treatment session for the hemiplegic arm following stroke.

Why is it being done?

Physiotherapists are required (by the Government and the Health Professions Council which registers and monitors all chartered physiotherapists) to provide the most effective treatment for all service users. The treatment offered should also be relevant to the goals and life style of the service user. It is thought (from research) that physiotherapists' decisions about treatment are based on their background knowledge and on information (spoken and through movement) provided by the client during the treatment session. It is not fully understood how therapists use all this information to decide on a treatment and this study is intended to explore this further.

Why have I been asked?

You have been asked to consider participating in this research because you are currently having physiotherapy after a stroke.

What am I being asked to do?

If you decide to participate you will be asked to give your written agreement (consent) for a video and audio recording to be made of a routine physiotherapy treatment session with the physiotherapist who usually treats you. The recording will be made of one session only and care will be taken to make sure that this does not interfere with your treatment during this session. There will need to be someone in the room looking after the camera but this person will not take any part in your treatment or affect your treatment in any way.

After the session you will be given the opportunity to look and listen to the tapes and to talk privately to the researcher about your treatment session (you may wish to have a relative or friend with you during this discussion, although they will be asked not to contribute and to allow you to explain things yourself). This will be arranged at a time and place that is convenient for you. Each discussion will last for approximately 45 minutes and this will be audio-recorded. Your comments will not be shared with anyone else without your permission, including the physiotherapist who treated you. You do not have to answer any questions that you do not wish to.

A written version of the discussion will be made and you will be asked to read this to make sure that you feel it is an accurate version of your comments. If you wish you will be able make further comments after reading this version if you feel this helps you to explain more clearly what you wanted to say.

What happens if I do not want to participate?

The choice to take part is completely voluntary and entirely up to you. If you do decide to take part, you will be asked to sign a consent form; however even if you have signed you are still free to withdraw at any time and without giving a reason. There is no obligation to take part and deciding that you do not wish to do so or that you wish to change your mind after giving your consent will have no effect on your physiotherapy treatment either now or at any time in the future.

What are the possible benefits of taking part?

Although you won't benefit directly from participating in this study, we hope that the information provided will benefit people in the future who experience stroke affecting movement of their arm.

Will the information I provide be kept anonymous?

Yes. The proposal for this study has been approved and passed by the Ethics Committee for Northumbria University School of Health Community and Education and the City Road and Hampstead Research Ethical Committee. We will follow ethical and legal practice and all information about you will be handled in confidence. Confidentiality, anonymity, and privacy will be ensured throughout the collection, storage, final report writing and publication of research material relating to this study.

The tapes will only be viewed by you (and your supporter if you would like this), the physiotherapist who has treated you, the researcher and her supervisor (only if necessary). All information about you will be identified by a

number only and your name and any details about you will be kept confidential. All details of the discussion you have when looking at the tapes will be kept anonymous and any comments you make cannot be linked to you. This confidentiality and anonymity will be maintained throughout the entire process including during the final report writing.

Will my doctor be aware that I have taken part in this study?

It is a condition of the NHS research ethics committee which gave agreement for this study to go ahead that in addition to asking for your personal consent to take part your doctor (General Practitioner, GP) should also give his/her consent before any information is collected about you. If you are still under the care of a hospital consultant it is also considered good practice for that doctor to be informed about any health related research studies, including physiotherapy, in which you have agreed to take part. However the information collected during this study will be kept confidential and your comments anonymised. If you agree to participate your doctor will know that you have taken part but no information which you provide will be passed on without your agreement.

This completes part 1. If the information in part 1 has interested you and you are considering taking part, please read the additional information in part 2 before making any decision.

Part 2.

What will happen to the data that is gathered?

The audio tapes, video tapes and written versions of the individual discussions/ interview will be allocated a number and the answers will not be attributable to any person; this anonymity will be maintained throughout the process including during the final report writing. The tapes will only be viewed by you, (and your supporter if requested), the physiotherapist who treated you, the researcher and the researchers supervisor (only if necessary). All information, including the video and audio tapes of the

physiotherapy session and audio tapes of the discussion will be stored within a locked cabinet and information collected from the tapes and interviews will be kept in password-protected files. All information will be kept in these secure conditions until completion of the project, after which they will be destroyed in accordance with Northumbria University policies for handling confidential material.

What will happen to the results of the research study - how will the research report be disseminated?

The outcomes of the research will be written up as part of the dissertation for my professional doctorate award. I am happy for you to see this; if you would like a copy, please indicate this on the attached consent form. It is anticipated that the finding of the research will be shared with other physiotherapists and medical professionals through journals and at conferences.

What next?

If you would be willing to participate in this study, the next stage is to complete the consent form and to give this to the person going through this information sheet with you: they will return this to the researcher. The physiotherapist who treats you will discuss with you when it would be convenient with you for the recording to be made.

Who do I contact if I have any questions?

If you would like further information about participating in research about stroke this can be obtained from the Stroke Association, the web link is: *www.stroke.org.uk/*

The local branch of the Stroke Association is located at:

[redacted]

If you would like independent advice or information about this research project please speak to your Consultant Physician or to [redacted] the Stroke Specialist Nurse or [redacted] the Clinical Lead Physiotherapist in Neurology, all can be contacted at [redacted]

If you have any questions or concerns, or would like further information about this research project, please do not hesitate to contact me at: Gillian.Bamborough@northumbria.ac.uk: 0191 2156328 or my university supervisor Professor Nicola Adams, Professor in Allied Health, Northumbria University Nicola.Adams@northumbria.ac.uk: 0191 2156620

Please feel free to retain this information sheet
Thank you for considering taking part.

Gillian Bamborough

INFORMED CONSENT FORM (client)

Title of study: Interaction between the physiotherapist and client following hemiplegic stroke.

This study has been reviewed and approved by the City Road and Hampstead Research Ethics Committee.
REC Number: 12/LO/0819
Name of principal Investigator: Gillian Bamborough, Senior lecturer in physiotherapy, Northumbria University.

Phase 3: An exploration of the interaction between therapist and client during delivery of physiotherapy intervention for rehabilitation of movement of the hemiplegic upper limb following stroke.

PLEASE INITIAL THE BOXES IF YOU AGREE WITH EACH SECTION.

1. I have read the client information sheet for phase 3 version V4 dated 25.05.12 and have been given a copy to keep. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my physiotherapy care or legal rights being affected. ☐
3. I agree to my physiotherapy treatment being audio recorded/video recorded and I understand that the written analysis of the treatment will be anonymised. ☐
4. I agree to my post treatment interview being audio recorded and I understand that the written analysis of the interview will be anonymised. ☐
5. I agree to my GP being informed of my participation in the study ☐

6. I know how to contact the research team if I need to. ☐

7. I agree to participate in this study. ☐

Participant name date signature

Researcher taking consent date signature

name

Original for Investigator Site File, 1 copy for participant.

Appendix xvii:

Example of intervention schedule phase 3

Start time	Finish time	Action	Position
00.00	03.02	Discussion with patient; patient demonstrating movements which she has achieved since last treatment session therapist guides, questions and observes active shoulder, elbow, forearm and hand movement Therapist tests strength and encourages range	Patient sitting unsupported on treatment plinth , therapist sitting beside her on right side
	04.10	Patient resting, slightly out of breath .Discussion about use of padded handle to make cutlery easier to use	
	05.32	Active fine finger and thumb movement with arm resting on table active scapula retraction	Table placed in front of patient
	06.19	Prompted to sit in more trunk extension, active assisted movement of right scapula patient comments it is stiff and therapist agrees Compares movement with left scapula checks for pain during movement on right	
	07.58	Active assisted glenohumeral flexion Mobilising of glenohuemral joint and palpation of pectoral muscles	
	09.08	Therapist mobilises and passively stretches pectoral bilaterally	Therapist moves to kneel on plinth behind patient
	09.58	Discuses with patient what she would like to be able to do functionally wither hand – lift up and drink from a cup , holding onto and wringing out a sponge when washing	
	10.46	Patient prompted to actively lifts her hand onto and off the table; catches it slightly Therapist and patient discuss the movement and identify areas to work on	
	11.51	Therapist guides the movement and patient takes over after several repetitions , does not catch her hand	
	12.47	Cup placed on the table patient actively reaches out and picks it up places it on the table with a thump	
	14.00	Movement repeated with guidance from the therapist to hold the cup more accurately	
	14.29	Discuss hand position for grasp and s current stiffness	
	15.20	Therapist examines patients hand and asks questions as she mobilises wrist and fingers	
	18.34	prompted and encouraged to try active finger and wrist extension patient tries again to lift the cup and places it gently onto the table	
	19.34	Patient actively lifts and places the cup in different positions on the table prompted and encouraged by therapist	
	21.00	Stacking cups prompted and encouraged to continue despite increasing challenge	
	22.30	Rest and pride at achievement	
	24.03	Unstacking cups	
		Facilitated shoulder flexion and elbow extension for reaching Trunk rotation included to reach in different direction across and away from her midline	Table removed, Therapist sitting in front of patient on a stool
	27.35	Reaching upward through shoulder elevation	
	30.00	Exploration of independent movement to continue to explore and discussion of future plans	

Appendix xviii:

Thematic categories phase 3

Example of client theming

Line	Comment	Description	Sub theme	Theme
2	Yeah, that's it, yeah. What I felt across there... She'd manipulated it beforehand or she was wondering if it had dropped again. Or... I'd gone back to the way it was.	Global feedback: interventions develop over several treatment sessions; Patient has insight into his own alignment problems from previous treatment sessions	Awareness of objective/goals	Collaboration
3	Yeah, but I felt as though, you know, she... I mean, she's the brains of the operation, sort of, she's the teacher and I'm the pupil.	Communication: role of the therapist Patient feels that the therapist leads the session and makes decisions about treatment	Decision making	Collaboration
26	She's pushing me down. But not... Not exactly pushing me down. She's placing me where I need to be. Not in... Like, there you go. She places me where I need to be for that specific exercise	Patient feedback about specific aspects of treatment: therapists hand position; Perception that therapist selects the correct position for treatment; indicates this through the hand placement and the pressure that he feels through her hands on his ribs/back	Effect of position of therapists hands	Client observation
40	She's thinking on her feet. I mean... She... In my sort of... In my sort of industry or anything like she'd be... Like, what's the term? She's	Communication: Patient therapist relationship; role of the therapist admiration for ingenuity and ability to adapt	Decision making Client therapist relationship	Collaboration Collaboration

	good at problem solving			
43	It's difficult when she's... Because she... Obviously I'm not a physiotherapist. I mean, I know the basic... Stuff, you know. Like... I understand what she says when she talks about the triceps and the biceps. But she, you know, all the other things. The ins and outs and all the rest of it. But talking to her, like I said... I felt as though my... My shoulder was in a right mess. You know, the muscles were in a right mess. Just... Seized up and all the rest of them. For all the... So much so she managed to manipulate my shoulder... Well, said that the one across it...	Patient awareness /understanding of movement: sensation Patient feedback about specific aspects of treatment: therapists hand position sensory awareness; mobilisation of scapula	Movement Effect of position of therapists hands; beneficial	Client physical awareness Client observation
50	Well, I don't know. Yes, and no. For the simple reason I don't know what she's going to do next. Because there's no two sessions are the same.	Global feedback; content of session; variety; session content varies so patient does not know what is going to happen next; Patient therapist relationship: role of therapist; therapist makes decisions about session content, delivery and sequence.	Satisfaction: variety Discussion	Client experience Collaboration
66	I think... The feeling, as it was, it was starting to... Feeling round my shoulder. Obviously she had	Patient awareness/ understanding of movement: sensation	Posture/position	Client Physical awareness

	a hold of my hand and everything like that. But you can see – you can obviously see there..	sensory awareness increases around his shoulder		
71	That's what I was saying earlier on. She's got something... She's got an objective in her mind and she's thinking all the time about how are we going to achieve that. And she's thinking on her feet all the time. She does... She thinks on her feet all the time. Which is a good thing	patient aware of need for therapist to progress treatment during the session	Awareness of objectives/goals	Collaboration
101	Well, to tell you the truth I paid no attention to it. All I was basically doing is, again... She was setting me up and telling me what to do. I never paid any attention whether it was hard material, soft material or anything, you know, so...	Client engagement focused on the movement rather than the texture of the object in his hand	Movement; Focus, engagement/involvement	Client physical awareness Client experience
115	It's no good me being dismissive. I... Right, what do you want? You know, I've got to join in with it. What do you want and where do you want it? What do you want me to do? It makes her job easy. She doesn't... Well, she hasn't... Got to bully me into doing something	client/therapist relationship: collaboration Patient recognises and supports Importance of working together	Client/therapist relationship	Collaboration

Example of therapist theming

Line	Comment	Description	Sub theme	Theme
2	Yeah, well, like you say – I hadn't seen for a little while, and I knew that from what people had said she had improved a little bit since the last time I saw her, so I thought I would just check range of movement and actually see what activity she did have.	Reassessment prior to treatment session	Re-establishing baseline	Treatment structure
4	And I wanted to see that if we could give her a bit more stability, whether she could actually access her forearm and her hand a little bit more as well.	assessment; analysis; normal movement patterns	Measuring/responding to change during treatment Movement: patterns	Treatment structure Treatment rationale
10	Because from having worked with patients for a long time, I know that it's the functional things that they, kind of, grasp and take away from the session more – than the exercises and how high they can lift their arm. It's whether they could pick something up. Whether they could do it	Intention to work towards function; background knowledge	Activity/function	Treatment structure
20	But what I was thinking was from what we'd been doing, I was thinking obviously she's a little bit flexed. I know what she's like in her trunk, and I know that she hasn't got the great stability	Analysis; background knowledge; effect of trunk flexion; joint alignment on activity of the upper limb	Movement: posture Movement: joint alignment	Treatment rationale

	there. Which is why she needed the assistance from me.			
21	So I was having a little look at that and thinking, "Right, we need to work on this before we can go on any further, to see if we can get some of that stability.	Analysis; background knowledge; a importance of proximal stability and joint alignment	Movement: joint alignment Movement: patterns	Treatment rationale
31	I think I'd, kind of, started thinking like that, but then with Barbara doing so well I think it just, kind of, flowed into what I was doing.	Assessment; analysis; informed development of session by therapists (background knowledge)	Influenced by knowledge (academic)	Treatment structure
48	And you can change the position of your hand and what you're actually moving when you're flat, into the palm, rather than things… Yeah.	specific description of technique and hand position ; soft tissue mobilisation; reflection in action	Movement: joint range Movement: position of therapists hands	Treatment rationale
57	I'd realised that she more activity in her hand, and from the fact that we'd done quite, you know, some small components – like loosening off her shoulder, looked at a bit of stability, she was starting to show that she had that… You know, bit more that she could do. I thought, "Right, well, let's try and challenge her. Let's work at different heights. Let's get some more, you know, different things involved. Different levels. And see if she can actually do things."	Detailed rationale about decisions made during treatment; based on continual reassessment observation and recalibration; stability/mobility; patient movement patterns and joint range of movement	Re-establishing baseline Measuring/responding to changes during treatment	Treatment structure

65	And she just needed a little bit… Particularly around the elbow, more like for biceps and triceps to know that we needed to get, you know, one side lengthened and one side shortened and when we needed to do it to come up… And then also that she needed to then do that but get the elevation and hand position to be able to clear…	Facilitation; background knowledge of aspects of movement control; collaboration; Therapist explains to patient specific aspects of movement needed	Communication: directing client's focus	Collaboration
68	I was confident that with her trunk she could correct with verbal prompts, it still gave me a little bit of control with her with that as well. Because she follows facilitation really well. So even the slightest thing, she'll then follow with you, so you can really control Barbara's trunk, head and arms. Just through her arm.	facilitation; hand placement to support or encourage active movement(therapist derives and facilitates trunk control from handling the arm)	Movement: position of therapists hands	Treatment rationale
74	Yeah, because she'd said she was already reaching for cups on her table at the start of the session. And I'd kind of thought, "Oh, I don't know how she's managing with that from what we've seen so far."	Linking treatment session to patient experiences of functional movement which they have initiated; assessing quality of movement after patient has explored it independently	Decision making :client initiates/defines intervention	Collaboration
83	But then she just went straight ahead and did it. Because we'd already worked on	Automatic movement; patient leading; treating impairment to apply to function	Decision making :client initiates/defines intervention	Collaboration

	it a little bit. And I think she thought, "Oh, I kind of know that that's what I should do." And it was automatic			
92	She was completely in control. I knew that I could let her go and that she would be able to get it there. I was confident in what she'd done before that she could, because I'd changed my hand hold anyway.	Assessment; analysis; reflection in action; background knowledge; experience	Influenced by knowledge Based on previous experience with this client Measuring/responding to change during treatment	Treatment structure
99	Because I think, , even in terms of letting go, she… I think with all patients, they focus so much on being able to not drop the cup, that they will grip… They will over-grip, and then to let go is something that's a lot trickier.	Therapist background knowledge; normal and abnormal grip and release strategies	Influenced by knowledge	Treatment structure

Example of client theme development

	Theme	Original Subtheme	Plan	Final theme
1	Client observations	1a Effort	Remains as 1a	1a Effort
		1b Effect of therapists hand position	change to 1c hand position	1b satisfaction
		1c Function	change to 1d function	1c Hand position
		1d Experimenting independently	move to theme 2a movement	1d function
2	Client experience Theme becomes physical awareness	2a Amount of therapy	change to 1b satisfaction	2a movement
		Success, variety	move to 1b Satisfaction	2b discomfort
		Focus, engagement, involvement	move to 3d engagement	
		Difficult, tiring, challenging, lots to remember	move to 1a effort	
3	Collaboration	3a Goals	move to 3c discussion	3a client therapist relationship
		3b Trust, respect, humour	move to 3a Client therapist relationship	3b discussion
		3c Decision making Therapist leads, client leads	move to 3b discussion	3c engagement
		Education, explanation, information, demonstration, past medical history	Discussion	Remains in 3b discussion

Example of therapist theme development

	Theme	Category	Subtheme
Theme 1	Treatment structure	Includes cognition	1a Based on previous experience with this patient
		Wide or specific areas	1a Planned in advance
			1c Influenced by other staff members
		Academic and experiential	1c Influenced by knowledge
		includes re-measurement after treatment	1b Re-establishing baseline
		Increasing or decreasing complexity of movement	1b Measuring/responding to change during treatment
Theme 2	Treatment rationale	Client control	2a Movement
		Patterns Proximal/distal interaction	2a
		Joint alignment	2a
		Posture	2a
		Position of therapists hands This includes if a specific positon for treatment has to be used to gain access)	2a
		Joint range	2a
		Sensation (should I call this touch)	2a
		Vision/ Visualisation	2a
		Strengthening	2a
		Repeated practise	2a
		Activity/function	2c
Theme 3	Collaboration	Directing client's focus	3a Communication
		Client/therapist share same focus of attention	3a
		Non-verbal	3a
		Therapists role/responsibility (includes not causing pain) Discussion of plans Limitations of service structure	3bDecision making

		Client defining intervention added	
		Patient experience	3c Empathy
Theme 4	Confidence		Treatment selected
			Level of skill
			Treatment selected
			Level of skill
			Successful